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Pronghorn, Sonoran

FISH AND WILDLIFE SERVICE

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Synopsis
NOTICE OF VIOLATIONS OF THE ENDANGERED SPECIES ACT IN CONNECTION WITH THE MARINE CORPS OPERATIONS IN THE YUMA TRAINING RANGE

ASSIGNMENTS

ROUTED TO	MAILSTOP	ACTION	DATE	DUE
R2		2 For Appropriate Action	11/25/96	

COMMENTS

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FWS - Region 2
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ACTION CODES

0 - Prepare Draft Reply
1 - Prepare Reply
2 - For Appropriate Action
3 - Surname
4 - Signature
5 - For Information
6 - Revise
7 - Obtain Additional Surnames
8 - Other - See Comments
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November 22, 1996

HAND-DELIVERED

Colonel C. J. Turner
Commanding Officer,
United States Marine Corps
Marine Corps Air Station
Headquarters Building 980
Yuma, Arizona 85369

Bruce Babbitt
Secretary,
United States Department
of the Interior
1849 C Street, NW
Washington, DC 20240

John Rogers
Acting Director,
United States Fish and
Wildlife Service
1849 C Street, NW
Washington, DC 20240

Re: Supplemental Submission on Yuma Training Range Complex DEIS and Notice of Violations of the Endangered Species Act In Connection With the Marine Corps Operations on the Yuma Complex.

Dear Gentlemen:

Defenders of Wildlife ("Defenders")[1] hereby provides notice, pursuant to section 11(g) of the Endangered Species Act, 16 U.S.C. § 1540(g) ("ESA"), that the ongoing and proposed activities of the United States Marine Corps Air Station - Yuma on, and over, the Barry M. Goldwater Range, Chocolate Mountain Range and the Cabeza Prieta National Wildlife Refuge violate the ESA by resulting in the unauthorized take of the Sonoran desert pronghorn, a species listed as endangered pursuant to the ESA. The Fish and Wildlife Service's ("FWS") biological opinion, dated April 17, 1996 is biologically and

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[1] This letter is also being submitted on behalf of Paul Huddy, a local conservationist from Tucson, Arizona. Mr. Huddy is a co-founder of Friends of Cabeza, a group which advocates for the preservation and conservation of the Cabeza Prieta Refuge. Mr. Huddy has been actively involved in efforts to preserve the Sonoran pronghorn population in southern Arizona.

legally inadequate -- in regards to both the pronghorn and the flat-tailed horned lizard, a species proposed for listing under the ESA -- and therefore neither the Section 7 consultation requirements nor the Section 9 take prohibitions of the ESA are being complied with.

BACKGROUND

The United States military utilizes vast areas of public lands in the Sonoran desert in southeast California and southwest Arizona for training activities, including low-level flights, ordnance delivery, strafing, rifle practice, and ground training. However, the Sonoran desert is also home to the critically endangered Sonoran pronghorn (***Antilocapra americana sonoriensis***), the flat-tailed horned lizard (***Phrynosoma mcallii***), and numerous other rare species dependant upon this fragile ecosystem. Due in part to the restricted access to military-utilized lands, these lands have become the last refuges for many such species.

The Yuma Training Range Complex ("YTRC") is a military training facility composed of the Chocolate Mountain Aerial Bombing and Gunnery Range, the Barry M. Goldwater Air Force Range, and approximately 10,000 square miles of air space in Arizona and California designated for military use. A portion of the Goldwater Range lies within the Cabeza Prieta National Wildlife Refuge and Wilderness. The entire Cabeza Prieta is within military air space use designation. Management of the land, airspace, and use of the YTRC is shared among the Air Force, Marine Corps, FWS, and the Bureau of Land Management.

In October 1995, MCAS - Yuma released the Draft Environmental Impact Statement Yuma Training Range Complex ("DEIS") for ongoing and proposed operations on the YTRC. According to the Marine Corps, the purpose of the proposed actions is to "maintain and upgrade the capability of the YTRC to optimize training benefits to Marine Corps and Naval aviation." DEIS at S-2. Proposed actions include reconfiguration of training airspace, development of new training facilities, and designation of new ground support areas. Id. Significant examples include an increase in fixed-wing flights over Cabeza Prieta by 400% from 14 hours flying time (over approximately 12 days per year) to 70 hours flying time (over 60 days per year), DEIS at S-10, reconfiguration of ground support areas which has the potential to disturb 16.5 square miles of desertscrub habitat -- including one within the Mohawk Mountains and Sand Dunes Area of Critical Environmental Concern, id. at S-19, 2-36, 4-39, and reconfiguration of helicopter overflight corridors so that two of three corridors are over the Growler Valley, which "seems to be the area of greatest use" by Sonoran pronghorn. Id. at 3-100.

On April 17, 1996, the FWS issued a biological opinion ("B.O.") for ongoing and proposed Marine Corps activities on the Arizona portion of the YTRC. FWS found that the MCAS - Yuma activities were not likely to jeopardize the continued existence of the Sonoran pronghorn. Included in the biological opinion is an incidental take statement, which "anticipates" the take of "[o]ne Sonoran pronghorn per ten years in the form of direct mortality or injury" and "[u]ndeterminable numbers of Sonoran pronghorn in the form of unintentional harassment of animals by low-flying aircraft . . .." B.O. at 52. The incidental take of a total of 36 flat-tailed horned lizards by death, injury, or habitat modification is also anticipated, along with "[u]ndeterminable numbers . . . through harassment . . .." Id.

The Sonoran pronghorn antelope is a critically imperilled inhabitant of the Sonoran Desert. Once numbering in the thousands, current population estimates vary from as low as 80 - 100 to 256 - 313. Sonoran Pronghorn Recovery Plan Revision, FWS (1994) ("Recovery Plan") at 8; Attachment A at 2-3 (letter from Hosack, Defenders of Wildlife to Rogers, FWS dated 9/27/96). The Sonoran pronghorn has been listed as an endangered species since 1967. 32 Fed. Reg. 4001 (3/11/67).

The U.S. population is now restricted to a fraction of its prior range due to habitat degradation and fragmentation resulting from residential development, highways, conversion of land to agricultural use, grazing, and military activities. See Recovery Plan at 8 ("possibly more than 75%" of historic suitable pronghorn habitat has been lost); Attachment B at 6 (letter from Maher, Montana State University to Rogers, FWS dated 10/15/96). In addition, the harshness of habitat to which pronghorns have been restricted exacerbates the impacts of such human activities and habitat degradation on the species. Attachment B at 6.

Defenders is extremely concerned that far from being on its way to recovering from these drastically low numbers -- where the species is vulnerable to extinction from stochastic events -- the pronghorn may be on a serious downward trend. Id. at 7. On October 15, 1996, pronghorn expert Dr. Christine Maher provided the Air Force with a review of its biological assessment for Air Force activities on the Goldwater Range. Maher noted that only 8 of 22 pronghorns radiocollared in November and December of 1994 remain alive today. Id. Moreover, only one of eight radiocollared females alive in 1996 produced a fawn. Id. As Dr. Maher explained, these data suggest that the "species' survival is of critical concern." Id.

Marine Corps activities on the Yuma complex include low-level helicopter and fixed-wing aircraft training, ordnance delivery, and ground support development. The negative effects of similar Air Force activities on pronghorn are described in the expert submission to FWS prepared by Maher. The Marine Corps

should seriously consider Dr. Maher's opinions in reaching its ultimate conclusion as to whether its activities will jeopardize the continued existence of the pronghorn and whether -- and in what form -- to implement the activities proposed in the DEIS. The Marine Corps must further consider the cumulative impact on the pronghorn resulting from its activities, the Air Force's activities on the very same YTRC, the Border Patrol's activities, and other stresses to species when making its final decision. See attachment B at 6 (noting that activities of Marine Corps and National Guard troops and other factors exacerbate effects of Air Force's activities).

The flat-tailed horned lizard is another denizen of the Sonoran desert facing potential extinction. In 1993, the FWS proposed to list the species as threatened "because of documented and anticipated population declines associated with widespread habitat loss, fragmentation, and degradation due to human activities such as agricultural developments, urban expansion, off-highway vehicle use, energy developments, and military activities." 58 Fed. Reg. 62624 (11/29/93).

Discussion

1. Implementation of the Proposed Actions in the DEIS Will Result in an Unauthorized Take of an Endangered Species.

The ESA prohibits the "taking" of endangered and threatened species by either a private person or a government agency. 16 U.S.C. § 1538 (a)(1)(B). The FWS may authorize the incidental taking of a species by a government agency if such taking "is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of [critical] habitat . . .." Id. at § 1536(a)(2),(b)(4). Such authorization must include a "written statement that . . . specifies the impact of such incidental taking on the species . . .." Id. at § 1536(b)(4) (emphasis added). As stated earlier, the B.O. "anticipates" an "undeterminable" amount of take through "harassment" of both the pronghorn and the lizard. B.O. at 52.

It defies logic for FWS to conclude that an "undeterminable," and therefore potentially infinite, amount of take, whether by direct killing, habitat modification, or harassment, is not likely to jeopardize the continued existence of a species. Moreover, it is similarly impossible to specify the impact of an undetermined amount of take. The legal -- and logical -- deficiency of allowing an "undeterminable" amount of incidental take is vividly illustrated by the FWS's admonishment in the B.O. that "[i]f the incidental take authorized by this opinion is exceeded, MCAS - Yuma must immediately reinitiate consultation with the Service to avoid a violation of section 9

of the Act." B.O. at 53. It is simply impossible for the Marine Corps, the FWS, or the public to know when an undetermined level of take has been exceeded.

At bottom, the incidental take statement is unlawful and may not be relied upon by the MCAS - Yuma. See Resources Limited v. Robertson, 8 F.3d 1394, 1400 (9th Cir. 1993) (Forest Service unable to rely on inadequate B.O. to avoid jeopardy determination by court). Therefore, if the MCAS implements the actions described in the DEIS and B.O., it will be in violation of section 9 of the ESA for the unauthorized taking of an endangered species.

2. The Proposed Actions, Especially When Viewed Cumulatively With Air Force Activities on the YTRC and Those of Other Agencies, Will Jeopardize the Continued Existence of the Pronghorn.

Section 7 of the ESA prohibits Federal agencies from carrying out actions that are "likely to jeopardize the continued existence of any endangered species or threatened species . . .." 16 U.S.C. 1536(a)(2). As the Corps has done, an agency "must consult[2] the [FWS] so the FWS can prepare a biological opinion assessing the likely impact of the proposed actions on any threatened or endangered species." Resources Ltd, 8 F.3d at 1399, citing 16 U.S.C. § 1536. However, "[c]onsulting with the FWS alone does not satisfy an agency's duty under the Endangered Species Act." 8 F.3d at 1399 (emphasis added). Therefore, the Marine Corps may not undertake activities which are likely to jeopardize the existence of the pronghorn based on the contrary opinion of FWS, if the Corps' "reliance on the FWS's opinion was not justified." Id.

Marine Corps' reliance on the FWS opinion would be unjustified for three reasons: 1) the incidental take statement is legally inadequate, 2) the scientific evidence clearly indicates that the activities of the Air Force, Border Patrol, and the Marine Corps are likely to jeopardize the continued existence of the pronghorn, and 3) the B.O. fails to take into

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[2] For species which FWS has proposed to list, such as the flat-tailed horned lizard, the action agency and FWS must "confer" regarding "any agency action which is likely to jeopardize the continued existence of [such proposed] species . . .." 16 U.S.C. § 1536(a)(4). The B.O. contemplates that "[i]f the species is listed . . . this biological/conference opinion [may be] adopted as a biological opinion for the flat-tailed horned lizard . . .." B.O. at 51. Defenders similarly has grave concerns regarding the impact of human activities in the Sonoran on the survival of this lizard and the legal sufficiency of the Marine Corps and FWS conference.

account the latest data on pronghorn mortality and recruitment.

a. It is arbitrary and capricious to conclude that the incidental take of pronghorn will not jeopardize the species based on the legally deficient biological opinion.

As discussed above, the incidental take statement does not conform with the requirements of the ESA. The deficiencies in the incidental take statement make it impossible for FWS or the Marine Corps to conclude that the allowed levels of take will not jeopardize the species. That is because there simply are no limits to the allowable levels of take by harassment from low-level flights to which the Marine Corps may subject the critically endangered pronghorns. B.O. at 52. No matter how many fright responses -- with their associated energetic costs -- are induced in no matter how many pronghorn, no matter how many times, the B.O. concludes that there will not be jeopardy to the species.

Clearly, low-level flights -- as well as other Marine Corps activities[3] -- "harass"[4] and adversely affect pronghorn. Indeed, the B.O. acknowledges that "[m]ilitary overflights, particularly low-level flights, may startle pronghorn, cause them to flush from cover, or could affect their use of an area," B.O. at 26, and that low-level helicopter flights elicit a more intense response in pronghorn than fixed-wing aircraft. B.O. at 38.

Maher describes in detail the manner in which low-level flights adversely affect pronghorn:

> [L]ow level overflights of jet aircraft, bombing, missile delivery, and strafing activity are likely to produce increased stress in the animals and a mild to severe flight

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[3] While the B.O. specifically notes that "[i]ntensive ground-based activities probably also flush pronghorn away from localized areas during maneuvers," the incidental take statement does not anticipate or provide for harassment of, or harm to, pronghorn by Marine Corps activities other than low-level flights. B.O. at 26. This deficiency is another reason why the B.O. cannot be relied upon to determine that jeopardy to the species will not result from the Marine Corps activities.

[4] "'Harass' in the definition of 'take' in the [ESA] means an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns, which include but are not limited to, breeding, feeding or sheltering." 50 C.F.R. § 17.3.

> response, resulting in increased expenditures of energy and, in turn, possibly reducing survival and reproduction. . . . Such impacts are even more dangerous if they occur during droughts or when food resources are not abundant, since these conditions will preclude increased forage intake, causing animals to utilize body reserves and resulting in deterioration in their condition. . . . Although a single response can alter the energy balance in an animal temporarily, repeated exposures . . . may result in an overall decrease in reproductive rates caused by increased stress and energy loss, an increase in abortions due to stress impacts on females in gestation, and an increase in fawn mortality through predation caused by separation of fawn from mother when fleeing from low-level overflight . . . .

Attachment B at 4 (emphasis added); see also B.O. at 37-44; Recovery Plan at 24 ("sublethal effects of stress may be highly detrimental to the pronghorn's well-being").

These are not trivial impacts that can be dismissed as "undeterminable." As already stated, the pronghorn is surviving at extremely low numbers, in a fraction of its historic range, in a very harsh environment, and subject to numerous threats. In regards to the Air Force's activities on the eastern part of the range Maher wrote, "Given the critically imperilled status of this subspecies, the population's low-reproductive rate, and a potentially high rate of mortality, Air Force activities must be halted immediately, pending a more substantive and thorough analysis of potential impacts to the pronghorns." Attachment B at 1-2; see Recovery Plan at 24 ("Further research is needed on cumulative effects of military low level overflights and reproductive efforts over extended periods along with other natural elements such as drought.").

Currently the Air Force does not even acknowledge that its activities are likely to "adversely affect" the pronghorn. Attachment C at 2 (White, USAF letter to Spiller, FWS dated 9/3/96). The Border Patrol also carries out low-level helicopter flights over the Cabeza Prieta refuge. B.O. at 26. Apparently, the Border Patrol has similarly denied that its activities are having any effect on pronghorn and have not consulted the FWS regarding them. Therefore, clearly, a closer, more comprehensive examination of the cumulative effects of low-level flights on pronghorn is required before a conclusion can be drawn that any level of harassment from low-level flights, by any and all of the agencies conducting low-level flights in pronghorn habitat, is not likely to jeopardize the continued existence of the critically endangered pronghorn. The Marine Corps should reinitiate consultation with the FWS to specify the effect of its low-level flights on pronghorn, the cumulative effects of all agencies' low-level flights -- especially in light of the Air

Force's and Border Patrol's positions -- and the effect on the species of the cumulative incidental take from the actions of all agencies operating within pronghorn habitat.

b. The B.O. fails to take into account new information regarding mortality and recruitment among radio-collared pronghorn, indicating a critical concern for the species survival.

"'[A]nother agency's reliance on [a FWS biological] opinion will [not] satisfy its obligations under the Act if [there is] 'new' information -- i.e., information the [FWS] did not take into account -- which challenges the opinion's conclusions.'" Resources Ltd., 8 F.3d at 1399, quoting Pyramid Lake Paiute Tribe v. U.S. Dept. of Navy, 898 F.2d 1410, 1415 (9th Cir. 1990).

The B.O. bases its discussion on the status of the pronghorn on "survey data collected from 1992 to 1994 [which] estimated 125 to 256 Sonoran pronghorn occur in Arizona." B.O. at 19. The estimates in the B.O. are both optimistic and fail to take into account the latest data on extremely high mortality and almost non-existent fawn recruitment among radiocollared pronghorn. The 1994 Recovery Plan provides a number of estimates of the population status at that time, but states that the scientific "literature has suggested that the population estimates have remained at about 80 to 100 animals." Recovery Plan at 8.

As Dr. Hosack explained in comments to FWS on the Air Force's biological assessment,

> the BA states that 'an estimated 125 to 256 Sonoran pronghorn occur in Arizona.' However, at a recent Population Viability Analysis (PVA) Workshop, organized by Defenders, a group of Sonoran pronghorn biologists suggested that the best current estimate for the US population is approximately 120, with several biologists suggesting that there may be as few as 80-100 remaining in the US. It appears that either the preparers failed to talk with Sonoran pronghorn experts in order to get these most current estimates, or else were unwilling to admit that the population is believed to be this low.

Attachment D (letter from Hosack, Defenders to Rogers, FWS dated 9/10/96) at 2.[5]

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[5] The results of the PVA workshop and modeling will be completed in early December. Significantly, the consensus among the experts attending was to model the likelihood of extinction of the pronghorn using 100, 120, and 160 as the current population estimate. Sonoran Pronghorn Antelope Population

Moreover, as detailed by Maher, the most recent telemetry data indicates "that only 8 of the 22 pronghorn originally radiocollared in November/December, 1994 remain alive today . . . [and] in 1996, only one of 8 radiocollared female pronghorns alive at that time produced a fawn." Attachment B at 7. Maher contends that such an extraordinary mortality rate -- if at all representative of the overall population -- means that the "species' survival is of critical concern." Id. None of this information is included in the B.O., but should be taken into account by the Marine Corps in making any final decision regarding its ongoing and proposed activities in this area.

3. Implementation of the Proposed Actions Would Not Conform to the Requirement in the B.O. that the Corps Locate Activities Outside of Pronghorn Habitat to the Maximum Extent Practicable.

As stated above, the FWS may only authorize the incidental taking of endangered species by issuing a written incidental take statement. 16 U.S.C. § 1536(b)(4). In addition to specifying the impact of the takes on the species, the statement must "specif[y] those reasonable and prudent measures that the Secretary considers necessary or appropriate to minimize such impact . . . ." Id. Additionally, FWS must "set forth the terms and conditions . . . that must be complied with by the Federal agency . . . to implement [such reasonable and prudent measures]." Id. (emphasis added). In the incidental take statement for the YTRC, the basic thrust of both the reasonable and prudent measures, and terms and conditions, is that the Marine Corps must stay out of pronghorn habitat "whenever possible." B.O. at 57 (term and condition 2.a. states "[w]henever possible, and given the requirements of the mission or action, MCAS - Yuma shall locate air and ground activities outside of . . . Sonoran pronghorn habitat"); B.O. at 53 (reasonable and prudent measure 2 states that "[t]o the extent practicable, military activities shall be located outside of . . . Sonoran pronghorn habitat").

However, as Defenders stated in its comments on the DEIS, the Marine Corps proposes to do just the opposite. Attachment E (letter from Hosack et. al, Defenders to Pearce, Marine Corps dated 3/28/96). For example, the Marine Corps proposes to reconfigure its helicopter training corridors in a manner which appears to concentrate activities in the Growler Valley. According to the DEIS, "[r]ecords from radio-telemetry studies show heavy [pronghorn] use in the southeast portion of the [Cabeza Prieta] Refuge" and "the Growler Valley seems to be the area of greatest use." DEIS at 3-100. Defenders strongly urges

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Viability Analysis (in preparation). The "best estimate" of the current population is approximately 120. Id.

the Marine Corps to comply with the mandatory terms and conditions of the biological opinion, and locate its activities outside of pronghorn habitat. The "East TAC" area of the Goldwater Range -- which we understand is currently uninhabited by the pronghorn -- is an example of an alternative location that should be utilized unless not "possible."

4. The Critical State of the Sonoran Pronghorn Requires the Marine Corps and FWS to Do Far More to Conserve the Species Than Mere Mitigation.

Section 7(a)(1) of the ESA requires Federal agencies to, "in consultation with and with the assistance of the [FWS], utilize their authorities in . . . the conservation of endangered and threatened species . . . .." 16 U.S.C. § 1536(a)(1). The ESA's directive to "conserve" envisions the "use of all methods and procedures [including 'habitat acquisition and maintenance'] which are necessary to [recover the species]." Id. at § 1532(3).

As Defenders explained in its comments to the Air Force on its biological assessment of the effects of Air Force training on pronghorn, the species has recovered little, if at all, since it was listed almost 30 years ago. Attachment A at 2. In 1982, FWS prepared a recovery plan which contained the objective of increasing the population to 300 animals, Sonoran Pronghorn Recovery Plan, FWS (1982) at 7, and then increased the recovery goal to at least 500 in 1994. Recovery Plan at 25-26. However, the 1994 plan acknowledged that the "[scientific] literature has suggested that the population estimates have remained at about 80 to 100 animals." Id. at 8. Moreover, as explained above, there are data to suggest that the pronghorn population is experiencing a downward trend which would indicate that the "species' survival [much less recovery] is of critical concern." Attachment B at 7.

Therefore, rather than proposing additional activities which will further imperil the very survival of this endangered species, the Marine Corps should, and under the ESA must, do much more to affirmatively conserve and recover the pronghorn. The current range of the pronghorn consists almost entirely of the Goldwater Range, Cabeza Prieta Refuge, and, to some extent, the Organ Pipe Cactus National Monument. See, e.g., Recovery Plan at Fig. 2 (1992 aerial survey pronghorn sightings). The Marine Corps and Air Force are the primary source of human disturbance in, and have substantial management control over, these areas. The onus to conserve the pronghorn must fall squarely on the broad shoulders of the United States Military. As Defenders' biologist Dr. Hosack stated in comments to the Air Force:

> in my opinion pronghorn mortality is so high and the survival of fawns, i.e., fawn recruitment, so low that the population cannot be sustained without some change in the current situation. . . . Two years of drought and predation may be contributing factors. But as the

> numbers continue to decline -- increasing the amount of genetic inbreeding as well as the risk that a single catastrophe will wipe out the pronghorns which remain -- each contributing factor becomes ever more important to the species' ultimate survival.

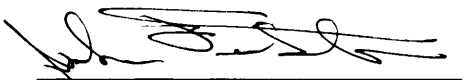
Attachment A at 4. The ESA mandates that the Marine Corps take affirmative actions to improve the dire status of the pronghorn.

CONCLUSION

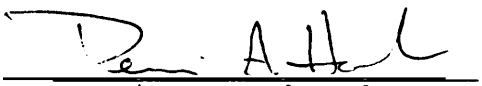
Defenders strongly urges the Marine Corps to carefully consider the attached submissions and reevaluate -- in consultation with the FWS -- its ongoing and proposed activities which are, and will continue to, take individual pronghorn, and likely jeopardize the continued existence of the species. If the Marine Corps does not reinitiate consultations with FWS within 60 days, Defenders will file suit to require compliance with the ESA.

Thank you for your attention to this matter.

Sincerely,



John Fritschie, Esq.
Wildlife Counsel



Dennis Hosack, Ph.D.
Conservation Biologist

John Rogers, Director
United States Fish and Wildlife Service
1849 C Street, N.W.
Washington, D.C. 20240

27 September 1996

Re: Biological Assessment for Sonoran Pronghorn on the Barry M. Goldwater Range

Dear Mr. Rogers,

On 10 September 1996 I wrote to express that Defenders of Wildlife ("Defenders") is concerned about the United States Air Force ("USAF") "Biological Assessment for Sonoran Pronghorn on the Barry M. Goldwater Range," prepared by Geraghty & Miller, Inc. and SWCA, Inc. As I explained in that letter, Defenders had not yet had a chance to review the Biological Assessment ("BA") in any detail and would provide more extensive comments as soon as possible. This letter constitutes our more detailed analysis and response to the BA. In addition, as I mentioned in my 10 September letter, Dr. Christine Maher, a pronghorn expert, will also be submitting an analysis of the BA. Dr. Maher's analysis will be provided to you shortly.

In order to put Defender's concerns with the BA in context, I think it would be helpful to review my background relevant to the issues raised in the BA, the relevant facts concerning the precarious status of the Sonoran pronghorn, and the military activities which are adversely affecting this critically endangered species.

I am a Conservation Biologist at Defenders of Wildlife ("Defenders") in Washington, D.C.. I received a bachelor of Science degree in Forestry from Kent State University in 1983, a Master of Science degree in Natural Resources with an emphasis on Wildlife Management from Humboldt State University in 1990, and a Doctorate in Forest Resources from the University of Georgia in 1995.

I was employed as a Wildlife Biologist by the United States Department of the Interior, Bureau of Land Management ("BLM"), Las Vegas District Office from June 1990 until June 1991. At BLM, I worked exclusively on Endangered Species Act compliance and recovery issues in the Mojave Desert ecosystem, particularly focusing on desert tortoise issues. I did extensive work in the field and prepared Section 7 Biological Assessments concerning proposed projects, often concluding that they were not likely to adversely affect any endangered

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ATTACHMENT A

or threatened species. The Fish and Wildlife Service ("FWS" or "Service") concurred with over 95% of the recommendations I made in these Biological Assessments.

In my professional capacity as a Conservation Biologist at Defenders, I have become very familiar with the Sonoran pronghorn, its current and former geographic range, its estimated population size and status, its habitat requirements, and the threats to its survival and recovery. I have reviewed all the literature cited at the end of this letter. In addition, in the course of my work on pronghorn issues, I have had the opportunity to consult with several pronghorn experts, including Christine Maher, Ph.D., an Assistant Professor of Biology at Montana State University, John Byers, Ph.D., a Professor of Wildlife at the University of Idaho, David Kitchen, Ph.D., a Professor of Wildlife at Humboldt State University, and John Hervert, a Wildlife Biologist at the Arizona Game and Fish Department ("AGFD").

I recently lead a Population Viability Analysis Workshop concerning the Sonoran pronghorn in Phoenix, Arizona from September 3-6, 1996. The workshop's objective was to use the best scientific population modeling techniques available in order to examine the likelihood of the Sonoran pronghorn subspecies' long-term survival. The workshop participants included the USAF, the FWS, the BLM, the National Park Service and the AGFD.

The Endangered Status of the Sonoran Pronghorn

The pronghorn has been listed as an endangered species since 1967. 32 Fed. Reg. 4001 (1967). Although at one time pronghorn numbered in the thousands and were distributed throughout Southern Arizona, based on the most recent data available I would estimate that there are presently only between 80 and 120 pronghorn in the United States. Although its historic range was much greater, in the United States today the species is primarily found on the Cabeza Prieta National Wildlife Refuge ("Cabeza Prieta Refuge"), the Organ Pipe Cactus National Monument, and the Barry M. Goldwater Range ("Goldwater Range"), all of which are located in Southwestern Arizona. In fact, in 1977, the Service recommended that almost all of this area be deemed critical habitat for the pronghorn. August 30, 1977 Letter from FWS Deputy Regional Director to Col. Ira Kimes, Luke Air Force Base (Attachment ("Att.") A). There is also a population of pronghorn in Sonora, Mexico, but to the best of my knowledge there is no interaction between these populations, in large part due to Highway 2 in Mexico which divides them, thereby making it impossible for them to interact and diversify the species' genetic makeup.

In 1982 the Service prepared an initial Recovery Plan for the pronghorn. Sonoran Pronghorn Recovery Plan (December 1982) (Att. B). The Plan's objective was to maintain the existing pronghorn population while developing techniques to increase that population to at least 300 animals. Id. at 7. In this Plan, the Service identified several measures that were necessary to the species' recovery, including to "[a]ssure Section 7

consultation is done on federal projects which could impact" the Pronghorn. Id. at 8-9 (emphasis added).

Over the next decade, however, the number of pronghorn did not significantly increase, and the recovery plan goals were never achieved. To the contrary, by 1994, when the Recovery Plan was last revised, the literature suggested that the total United States population remained as low as 100 individuals. Sonoran Pronghorn Recovery Plan Revision (August 1994) (Att. C). At the same time, the Revised Recovery Plan concluded that at least 500 animals were needed to recover the species, noting that the earlier estimate of 300 animals "was not based on a substantial amount of life history information." Id. at 25-26.

The Revised Recovery Plan identified several factors which may be adversely impacting pronghorn recovery. For example, the Plan noted that pronghorns are particularly susceptible to disturbances caused by the presence of humans. Indeed, the FWS concluded that pronghorns experience increased heart rates in the presence of human auditory and visual disturbances, and that such "sub-lethal effects of stress may be highly detrimental to the pronghorn's well-being." Id. at 19, 24. In particular, the FWS concluded that "does with late fawns [offspring] and does in late pregnancy [are] highly reactive to any form of harassment . . . ." Id. at 24 (emphasis added).

The Revised Recovery Plan also calls for Section 7 consultation "for actions that affect [the] survival of Sonoran pronghorn," id. at 27, and specifically emphasizes that it is crucial for recovery of the species that the military "[s]trive for higher flight ceilings for training routes and minimize other military activity that impact Sonoran pronghorn." Id. at 29, 34, 36 (emphasis added).

In late 1994, AGFD began a monitoring program to gather information on pronghorn movements and behavior. John M. Hervert, et al., Sonoran Pronghorn Population Monitoring: Progress Report, 1995, at 1 (Att. D). AGFD put radio-collars on twenty-two of the estimated 100 pronghorns, and began monitoring the animals' movements on the Goldwater Range with telemetry instruments. The AGFD also installed remote sensing cameras and other detection equipment in various locations.

The telemetry data have revealed two extremely important facts for purposes of evaluating the effects of the USAF's activities on the pronghorn. First, of the twenty-two pronghorn that were collared in 1994, fourteen of them have already died. See Monitoring Report (Att. D) at 4 (showing that six of the animals had died by August 1995).[1] Second, the telemetry data show, in no uncertain terms, that pronghorn are

[1] I have been informed by officials at AGFD that since the August 1995 Report an additional eight collared pronghorn have died.

present in the areas of the Goldwater Range that USAF pilots bomb, strafe and fly over at low altitudes on a regular basis. (Att. E).

According to the preliminary data available from the Population Viability Workshop that I led earlier this month, as well as the most recent data from AGFD concerning collared pronghorn, in my opinion pronghorn mortality is so high and the survival of fawns, i.e., fawn recruitment, so low that the population cannot be sustained without some change in the current situation. Among the collared animals, fawn recruitment is zero, while mortality is over 60 percent. These statistics raise serious questions about the pronghorn's continued survival. Indeed, our models revealed that assuming even a 25 percent fawn recruitment rate, the population will nevertheless go extinct.

There is some uncertainty regarding the causes of this decline. Two years of drought and predation may be contributing factors. But as the numbers continue to decline -- increasing the amount of genetic inbreeding as well as the risk that a single catastrophe will wipe out the pronghorns which remain -- each contributing factor becomes ever more important to the species' ultimate survival. In my professional opinion, the ongoing military activities in the North and South Tactical ("TAC") areas of the Goldwater Range -- areas where Pronghorn have been documented on numerous occasions -- are definitely contributing to this problem.

The Military Activities on the Goldwater Range.

As explained in the BA, USAF pilots drop and fire live ordnance on the Goldwater Range in three tactical areas ("TACs") -- North-TAC, South-TAC, and East-TAC. BA at 10-13. North-TAC and South-TAC -- the TAC ranges inhabited by pronghorn -- contain simulated targets including aircraft, control towers, hangars, administrative buildings, trucks, trains, tanks, missile sites, and high explosive ("H.E.") hills. Id. at 11.

The USAF is engaged in three activities in these areas which are likely to be adversely affecting the pronghorn. First, pilots drop live bombs on and near High Explosive (H.E.) Hills. According to my review of USAF documents, bombing occurs both during the day and at night, may be conducted in multiple bombing runs over the course of a day, and takes place up to twelve days of the month. (Att. F). These bombs are up to 1000 lbs., and from October 1995 until June 1996 over 650 of them were dropped on South-TAC and North-TAC H.E. Hill. BA at 11-12.

Second, USAF pilots strafe these areas, which involves machine gun fire from low altitudes. A number of targets within South-TAC and North-TAC are specifically targeted for strafing. In addition, as part of these bombing runs, pilots typically strafe the area near the H.E. Hills without any designated targets.

Finally, USAF planes fly through these areas at low altitudes. I have been told by USAF personnel that these planes fly as low as 150 feet. They certainly fly as low as 500

feet, however -- as conceded by the USAF's own BA -- which is still too low to adequately protect the pronghorn. Over 50,000 individual flights, called "sorties," were flown in the Range in fiscal year 1995, principally in F-16s and A-10s. BA at 8. To minimize adverse effects on wildlife, the USAF restricts almost all of its flights over the Cabeza Prieta Refuge portion of the Range to 1,500 feet above ground level. BA at 20. However, the USAF itself has informed Defenders that there are no minimum altitude restrictions for that part of the Range outside the Refuge. (Att. G). Although the USAF appears to maintain that all its flights are above 500 feet, flights over pronghorn inhabited areas have in fact been as low as 100 feet. Revised Recovery Plan (Att. C) at 21.

As previously mentioned, through telemetry data and remote cameras, the AGFD has recently documented numerous pronghorn on both North and South-TAC. (Att E). Moreover, in the past year, the AGFD has actually detected pronghorn near and even on the H.E. Hills themselves. As part of the AGFD monitoring program, last summer an automated camera photo-documented groups of up to 13 pronghorn visiting a bomb crater near South-TAC H.E. Hill, primarily in the morning and late afternoons. December 4, 1995 Meeting On Sonoran Pronghorn at H.E. Hill S-TAC (Att. H) at 1. AGFD has also detected pronghorn foraging around the Hill, bedded down on the hill, and near other targets in South-TAC. Id. As the USAF itself noted, AGFD officials "have documented Sonoran pronghorn at water sources, including a rain-filled crater on South TAC, on numerous occasions and have observed pronghorn drinking as frequently as twice a day." BA at 16 (emphasis added).

The USAF's Refusal To Take Measures To Protect the Pronghorn.

Although the USAF has known since at least 1989 that pronghorn are present within the areas used for military training, until this month -- and in the face of a legal challenge by Defenders -- the USAF had never entered into formal consultation regarding the matter, as required by Section 7 of the ESA. In fact, a 1989 study of pronghorn on the Goldwater Range concluded that the pronghorn "that have a home range north of the Refuge use the areas in and around the military use zones on a regular basis." Evaluation of Sonoran Pronghorn Movements Around Military Activity Sites on Barry M. Goldwater USAF Range (October, 1989) (Att. I) at 13 (emphasis added). Indeed, the Study suggests that pronghorn may actually be drawn to the H.E. Hills. Id. Pronghorn often rest, or bed down, at higher elevations and on the slopes of hills because it facilitates their ability to detect approaching predators.

Given this evidence, and in particular the recent documentation of pronghorn presence in North-TAC and South-TAC, the FWS has already expressed concern that USAF activities may be harming the pronghorn. Thus, in a recent Biological Opinion that the

FWS prepared concerning Marine activities on the Goldwater Range, the Service concluded that:

> pronghorn use both the North and South Tactical Ranges and ordnance or shrapnel could potentially strike and kill or injure a pronghorn. In addition, pronghorn could be injured during an encounter with unexploded live ordnance on the ground.

Biological Opinion and Conference Opinion for Existing and Proposed Activities by the Marine Corps Air Station (April 17, 1996) ("Biological Opinion") (Att. J) at 44. The Service further stated that although "[n]o pronghorn are known to have been harmed by ordnance or shrapnel, [ ] killed or injured animals would probably quickly succumb to predators or scavengers and would leave little evidence." Id. The Service also noted that, "[a] group of pronghorn have been seen regularly in the vicinity of a bomb crater that seasonably fills with water near HE Hill on the South Tactical Range [ ], and may be at risk (Robert Barry, Wildlife Biologist, Luke USAF Base, pers. comm., 1996)." Id.

For these reasons, the Service concluded that it "is very concerned that delivery of ordnance . . . at targets on the North and South tactical ranges could result in take of Sonoran pronghorn." Id. at 48 (emphasis added). However, the Service declined to conclude that the Marine Corps' activities constitute such an illegal "take" of the pronghorn under the ESA, explaining that, "because [the Marines] do[ ] not manage these ranges and [their activities] represent only a small part of the overall use of them, an analysis of the effects of ordnance delivery at the North and South tactical ranges would be more appropriately addressed in a consultation with Luke USAF Base." Id. (emphasis added). In other words, the Service has concluded that the Air Force -- rather than the Marine Corps -- is principally responsible for impacts to the pronghorn from military activities in this area.

In fact, on December 8, 1995, Sam Spiller, Arizona State Supervisor for the FWS Ecological Services Office, wrote a letter to Captain M.S. Monroe, Chief Environmental Flight for the USAF at the Goldwater Range, recommending that the USAF engage in formal Section 7 consultation with the Service to determine the effects of USAF activities on the Pronghorn. (Att. K). Mr. Spiller further stated that regardless of the consultation process, if pronghorn are currently in danger of being disturbed -- i.e. "harassed" within the meaning of the ESA -- "then something should be done immediately to eliminate those effects." Id. (emphasis added).

The USAF did not respond to the FWS's suggestions. Instead, having just completed two months of maintenance and clean-up -- during which it ceased its military training in this area -- on March 4, 1996 the USAF resumed its live fire

activities on the Hill despite the fact that, on March 3, radio telemetry data showed three to four Pronghorn bedded down on the north side of the South-TAC H.E. Hill. (Att. L). Remarkably, as the Service itself has observed, this is a time period "when pronghorn may be with fawns and would be most sensitive to human disturbance." Biological Opinion (Att. J) at 36.

On March 12, 1996, Mr. Spiller again wrote to Captain Monroe. (Att. L). He explained that in the Service's view the USAF activity "may be affecting or even resulting in mortality of Sonoran pronghorn." Id. (emphasis added). He further concluded that "[f]ormal section 7 consultation appears to be indicated," and he suggested that, in the meantime, "[o]ne course of action that may prevent take of Sonoran pronghorn would be to cease using the area as a live-fire site." Id. (emphasis added). However, once again, the USAF refused to cease its military activities on H.E. Hill. Moreover, although the Service -- in its letter as well as in its April Biological Opinion on Marine Corps activities -- had determined that the USAF's activities "may be affecting" pronghorn, the USAF failed to enter formal consultation as required by Service regulations. Instead, on March 14, 1996, Captain Monroe informed the FWS that the USAF will prepare a biological assessment to determine whether its activities "may affect" the pronghorn. (Att. M).

On May 22, 1996 Defenders served the USAF with notification that the USAF was in violation of both Sections 7 and 9 of the ESA for continuing to bomb, strafe and fly at low altitudes in areas frequented by the endangered pronghorn, and for failing to engage in formal consultation concerning these activities, which clearly "may adversely affect" the species. Defenders further notified the Air Force that, unless it ceased its military activities pending compliance with the Section 7 process, Defenders intended to bring a lawsuit to enjoin these violations of the ESA. (Att. N).

In response, by letter dated June 17, 1996, Brigadier General Carrol H. Chandler informed Defenders that its BA will be used to determine "if it will be necessary to enter into a formal consultation." (Att. O). He also informed Defenders that the USAF had undertaken efforts to identify whether pronghorn are present on the South TAC H.E. Hill on the morning of each day that military exercises are scheduled to take place, and that, if pronghorn were detected, the USAF would not conduct any bombing on that day. Id. These efforts involve two elements. First, early in the morning of scheduled bombing, an USAF biologist drives around South-TAC H.E. Hill and stops in 5-6 locations to use binoculars and telemetry equipment to look for pronghorn. Second, the first pilot over the Hill on a bombing run does a "clearance pass" at approximately 480 knots to look for pronghorn. As explained below, however, these efforts fall far short of ensuring that these endangered animals will not be harmed by the Air Force's activities.

First, these efforts are apparently limited to South-TAC -- i.e., no such comparable efforts are undertaken for North-TAC, where pronghorn are also present. Second, despite General Chandler's representation, H.E. Hill is still not surveyed every time there is a bombing run. Indeed, according to the USAF's own reports, on both July 15 and 16, 1996, when the biologist responsible for surveying the Hill was unable to get to H.E. Hill, bombing runs nevertheless took place, i.e., without any ground survey at all. (Att. P) at 10-11. Third, when a survey is done, it is only conducted once a day, in the early morning, despite the fact that pronghorn may move into the area at any time of day or night. For the same reason, the single fly-over done for this purpose is also inadequate to ensure the absence of pronghorn during these military activities.

Fourth, the biologists' survey is extremely limited and cannot guarantee that pronghorn are not present in the area. Within South-TAC around H.E. Hill, there are several jeeps, tanks and other vehicles. The nearest of these vehicles is located approximately 1,000 yards from the base of H.E. Hill. Based on my two visits to South-TAC, it is my professional opinion that given the topography, vegetation and vehicles, even using binoculars it is not possible to ascertain whether any pronghorn are in the area. In fact, even the USAF's own biologist has conceded that the possibility exists that pronghorn remain within the square mile surrounding H.E. Hill at the time he looks for them. (Att. O) at 2.

Fifth, the telemetry data also have extremely limited value, since so few collared pronghorn remain -- i.e., of the 100 or more remaining pronghorn, only 8 are presently collared and thereby trackable using telemetry equipment. And finally, no efforts at all are undertaken to ascertain the presence of pronghorn with respect to strafing and low-level flights -- which are also detrimental to this species.

Defenders' Involvement in this Issue

I first visited Luke USAF Base on June 7, 1996 to meet with USAF personnel concerning the presence of endangered Sonoran pronghorn in areas where the USAF is conducting these military activities. During that visit, we traveled to the South-TAC area on the Goldwater Range. We drove around the High Explosive ("H.E.") Hill on South-TAC, and I had an opportunity to view H.E. Hill and the surrounding area with binoculars. There was some vegetation in the area surrounding the H.E. Hill. The area was also pock-marked with craters caused by the bombs the USAF drops there. Based on this visit I concluded that it is not possible to be certain whether any pronghorn are in the area.

I returned to Luke USAF base on August 19 and 20, 1996. On August 20, Dr. Christine Maher of Montana State University and I met with Major Buglewicz, an

instructor pilot, Bruce Eilerts, the supervising biologist at Luke USAF Base, Colonel White, several other Luke biologists -- Robert Barry and Charles Hayes -- and Robert Henry from the Arizona Game and Fish Department.

During this visit I had a conversation with Major Buglewicz concerning pilots' efforts to ascertain whether pronghorn are in the area prior to dropping live ordnance. According to the Major, these efforts -- which he sometimes conducts himself -- are done in the same planes used for bombing runs. The pilot flies over the Hill at approximately 480 knots. I asked the Major what the pilots do during the flyovers, and he explained: "If they're smart, they're checking their instruments and preparing for the actual bombing run so that they're ready." This statement indicated to me that such fly-overs are basically useless in ensuring that pronghorn are not present in the area during bombing and other military activities.

During the August 20, 1996 visit Dr. Maher and I visited all three TAC ranges. We viewed the North-TAC H.E. Hill from approximately 500 yards. Given the vegetation, topography and vehicles and debris in the vicinity of the Hill, it is absolutely impossible to ascertain whether pronghorn are in the North-TAC H.E. Hill area by viewing it from the roadside.

We next went to South-TAC. It had changed dramatically since my visit in early June. Due to recent rainfall, there was a great deal of vegetation in the area, some of it five or six feet tall. We drove to one of the spots where a biologist looks for pronghorn the morning of a bombing run, and I stood on the bed of the truck and looked through binoculars at the area. I was even more certain than I had been in June that there is absolutely no way this method ensures that pronghorn are absent from the area prior to a bombing run.

During this visit to South-TAC we went to the crater hole where pronghorn had been photographed by a remote camera in the Summer of 1994. The hole is approximately 50 yards from the base of H.E. Hill. The hole was filled with water from the recent rains, and on one side it narrowed to form a lip which, in my opinion, would serve as a nice lead to the water if pronghorn want to drink from it.

The Biological Assessment

I have now had the opportunity to carefully analyze the USAF BA. My overall conclusion remains unchanged from my earlier letter -- this is a poorly developed, hastily assembled document that does not support the biological conclusion that the USAF's activities are not adversely affecting this endangered species. The initial 12.5 pages of the document attempt to describe what occurs on the Goldwater Range, leaving less than 9.5 pages to cover the potential impacts of

those activities on Sonoran pronghorn. In other words, this document, which was supposed to detail the effects of USAF activities on a severely endangered species, spends more time informing the reader about the activities than it does on how these activities impact this species. It is Defenders opinion that, instead, the majority of the document should have addressed how the more than 50,000 sorties flown during 1995 alone potentially affect the viability of Sonoran pronghorn.

In fact, it is Defenders' opinion that the BA authors had made a decision prior to preparing this BA that there was to be a conclusion of "not likely to adversely affect" as a result of this BA and that the BA was simply viewed as a paperwork exercise geared at reaching this conclusion. This conclusion, however, cannot withstand scrutiny, given the available evidence that indicates that this population is in serious trouble and may be experiencing a decline that will foreclose recovery of the species. It is an undeniable fact that USAF activities are a factor, and a very identifiable factor, negatively influencing this population. Moreover, these USAF activities which are jeopardizing the existence of Sonoran pronghorn may be the one and only contributing factor of Sonoran pronghorn decline that can easily be identified and remedied.

In order to respond to the BA in more detail, I would like to point out some of its specific shortcomings, as well as contrary information that exists and should have been considered in this document:

1) Page 13, Lines 24-26: The BA states that "Subspecific distinctiveness was based on small size, pale coloration, and cranial features, but has been questioned by Cockrum (AGFD, 1981)." However, Wright and deVos (1986) suggested that four Sonoran pronghorn skulls that were killed illegally in Mexico in 1969 "show similarities to the holotype for sonoriensis and exhibit differences from the other four subspecies" (as does the holotype), lending support to the continued recognition of sonoriensis as a valid subspecies of Antilocapra americana. In addition, Wright and deVos (1986) suggest that the authors of the Arizona Game and Fish Department (1981) report agreed that further study of both physiological and behavioral characteristics would clarify the taxonomic questions that the BA portrays as the overriding conclusion of biologists. Thus, the only really relevant facts on this issue are that (a) Sonoran pronghorn is a recognized subspecies, (b) the subspecies is endangered, and (c) population estimates indicate that they are declining.

2) Page 14, Lines 5-9: The BA suggests the following: "Precise determination of the historic range of the Sonoran pronghorn is precluded by a lack of specimens and the largely anecdotal nature of historic records. However, the historic range may have extended west to the Salton Sea in California, north of the Gila River, east to the Baboquivari Mountains in Arizona, and south to Bahia Kino or Guaymas in Mexico." Defenders believes that "precise" determination of any species historic range is difficult if not impossible, since early man did not keep records that we can inspect and verify. Our desire is to have an accurate (i.e., nearness of a measurement to the actual value of the variable being measured [Zar, 1984]) description of the historic range of Sonoran pronghorn, whether or not it is precise (i.e., the closeness to each other of repeated measurements of the same quantity [Zar, 1984]). Nevertheless, six of the documents cited in the BA consider that the pronghorn's "historic range may have extended" to the historic range boundaries described in the BA. Therefore, we do not believe that the historic range is controversial, nor is it particularly relevant to the issue of the effects of USAF activities on the current population of Sonoran pronghorn.

3) Page 14, Lines 12-15: Once again, we would like to stress our distrust of comparing population estimates from 1925 with population estimates of 1994. The BA correctly points out that "the data are insufficient to determine trends in population size since 1925" and we believe that this alone should prevent ethical scientists from presenting a graph like Figure 3 in the BA.

4) Page 14, Lines 16-37 and Page 16, Lines 1-3: The entire discussion of Sonoran pronghorn historic population size is based on the lack of precise data concerning the number of pronghorn that existed in this range in 1925. However, if one relies on the historic range of Sonoran pronghorn to determine population size (even if that historic range is smaller than what most experts believe it to be) then it is obvious that such a range would be home to significantly more than the number of pronghorn presently estimated as the population. Mr. Jim deVos and Mr. John Hervert (arguably, the two most knowledgeable Sonoran pronghorn biologists in the world) have asserted that there is no

doubt that Sonoran pronghorn numbers were much larger in the past than what survives today. In fact, deVos (1990) states that "the number of Sonoran pronghorn in Sonora and Arizona appear to have declined from historic levels." deVos (1990) also states that "accurate information on distribution of this subspecies is largely lacking because it was not described until 1945, years after some marginal populations had been extirpated and the overall population had declined." Hughes and Smith (1990) also state that "historic observations indicate that pronghorns were once seen frequently and in large numbers in southern Arizona and northern Sonora, Mexico." It is interesting that the authors of the BA seem to be of the mind set that when scientifically reliable data are absent, this is cause to believe that no effect exists. For example, since there are no records specifically indicating that Sonoran pronghorn were once more plentiful, this means, to the BA authors, that Sonoran pronghorn were never more plentiful than at present. This is analogous to the illogical thinking that since we have no evidence indicating that driving a car at 1,000 mph will result in death if one is in an accident, then driving at 1,000 mph is safe. The BA authors finally state that "because the term 'abundant' is not quantified and these observations are from a small area of the currently known range, no reasonable conclusion regarding total population size can be made." Defenders assumes that this means that the BA's conclusion, that population size was never larger than it is currently, is insupportable.

5) Page 16, Lines 27-29: The BA states that "Hervert et al. (1995) acknowledge that preformed and metabolic water in the diet apparently supply Sonoran pronghorn with at least the minimum water requirements needed for long periods of time." This again is faulty scientific logic. The question is whether or not "the minimum water requirements" is what one would want to allow for an endangered species that may have declined to 80 individuals. It is Defenders position that one would want to allow much more than the minimum amount of any resource so that a imperilled species such as the pronghorn could utilize that resource to the best of its ability, resulting in a potential population size increase. Maintaining minimum amounts of water may allow an

adult to survive, but may result in increased fawn mortality, decreased reproductive output, and overall population decline.

6) Page 17, Lines 7-10: The BA makes reference to the Sonoran Pronghorn Recovery Plan (USFWS 1982) recovery objective to "maintain existing population numbers and distribution of Sonoran pronghorn while developing techniques which will result in a U.S. population of 300 animals." Defenders has learned, from reading Core Working Group Notes, that this "recovery goal" was chosen simply because the drafters of the Recovery Plan believed that there were about 150 pronghorn and decided that the goal should be doubling that number. The BA should have addressed the scientific validity of such an approach, as well as how USAF activities may be affecting any increase in population numbers, ignoring some arbitrary goal of 300. If there is any reason to even discuss recovery goals in the BA, the discussion should have focused on the management approaches that can be implemented to increase the likelihood of survival of the population into the future, not on some arbitrarily chosen number. Moreover, the Revised Recovery Plan currently proposes a recovery goal of 500.

7) Page 17, Lines 16-20: The BA authors suggest that "the vast majority of the Arizona range is within the boundaries of BMGR including CPNWR. The majority of sightings have been recorded on CPNWR and the northwest portion of OPCNM suggesting that these areas are preferred habitat". One of the first lessons well-trained biologists learn (I first heard it when I sat in on an undergraduate Wildlife Techniques lecture by Dr. Richard Golightly at Humboldt State University) is that at no time can we, as humans, decide what some animal "prefers." We may be able to infer that an animal or species is selecting certain items more often than others, or in greater proportions than they are available in the wild, but this does not equate to "preference." For all we know, what Sonoran pronghorn may prefer is the habitat that the USAF is currently impacting, it is just that with the USAF negative influences, they are <u>avoiding</u> that habitat, to some degree. This is important, since a species may do better in

another place if it were not for human influences (e.g., bombs being dropped), but since those influences are "degrading" the habitat in terms of attractiveness to the animal, they spend time and/or effort utilizing other areas/food/etc. It should also be noted that, regarding the telemetry data, even the BA concedes that the capture locations for collared animals were not randomly located throughout the pronghorn range, but rather clumped, potentially resulting in clumped relocations and biasing any conclusions about habitat use. Finally, deVos (1989) concluded that some pronghorn "use the areas in and around the military use zones on a regular basis."

8) Page 17, Lines 24-26: It is absolutely inappropriate to suggest that no deaths or injuries have resulted due to military activities on the Range. An obvious question is: "what techniques have been used to detect injury and or death to pronghorn on the Range?" It is Defenders understanding that at no time has any systematic methodology been in effect for determining if any pronghorn have been injured or killed due to USAF activities. In the Sonoran desert, as elsewhere, the death of an animal is not the final disposal of that animal. Rather, there are plenty of species that survive and multiply through the use of dead animals. Foxes, coyotes, bobcat, vultures, etc. will not waste any time in claiming a dead animal. Surely the USAF realizes that if pronghorn are killed out on the range, these carcasses are not just decaying where they lie. As has been pointed out by many pronghorn biologists, it is difficult to spot a pronghorn when you fly over in a Cessna even when you have radio telemetry equipment telling you there is an animal under you. How can anyone be confident that a dead pronghorn on the Range will be observed, even if someone was looking for it right after it was killed? In fact, the Air Force has not allowed officials from AGFD onto the TAC Ranges during military exercises. Additionally, injured animals may wander a great distance before succumbing to their injuries. There is no indication that the USAF has surveyed the immediate area, let alone the adjoining habitat looking for dead pronghorn.

9) Page 17, Lines 26-31, Page 18, Lines 1-7: It is my professional opinion that the bombing, strafing, and low-

level overflights that are occurring on the Barry M. Goldwater Range meet the legal definition of "take" which is included in the Endangered Species Act. The undeniable fact is that the USAF activities have the potential to kill and/or injure Sonoran pronghorn through the bombing activities that occur on High Explosive Hills (both on the North and South Tactical ranges). We know that there have been numerous occasions when pronghorn have been in the immediate vicinity of H.E. Hill on South-TAC (as evidenced by pictures of as many as 12-15 pronghorn gathered around a bomb crater near H.E. Hill). It is also a fact that these are practice bombing ranges, meaning that bombs do not always reach the Hill, but often find the desert floor adjacent to the hill. I have been on North, South, and East-TAC and have seen the many craters that exist in the areas surrounding the H.E. Hills. There is no doubt that pronghorn use these areas (on North and South-TAC), that bombs land in the areas pronghorn use, and that bombs kill.

Strafing is another way in which pronghorn could be killed and/or injured. There are separate strafing areas away from the H.E. Hills, but there is no one out there to tell pronghorn that these are areas reserved for USAF war games and pronghorn should avoid them if they want to live. In addition, there are strafing targets throughout North and South-TAC which may be inhabited by pronghorn at the "wrong" time and result in pronghorn death or injury.

Finally, low-level overflights have the potential to kill animals, and definitely harass them. I have been told by a USAF Pilot Instructor that "anything on the ground when one of these planes goes over will run for its life". Obviously this type of response could easily result in actual death, but certainly would fit the definition of harassment. It does not take much of a stretch of the imagination to see how separating a female and her fawn could result in stress to the female and greatly increase the opportunity for the fawn to be a victim of predation. Moreover, all of these activities have the potential to disrupt breeding patterns by increasing the level of stress the animals must endure.

10) Page 18, Lines 30-31: As it must, the BA concedes that "the potential for death or injury definitely exists," but then concludes that "the probabilities appear to be very low." However, there is no reasoning for how this conclusion

was reached, except that the next sentence suggests that a pronghorn would have to be in a live target area during ordnance delivery to be killed. Defenders questions why this would make the probability of occurrence very low. Is there data that suggest that pronghorn occurrence in these live target areas is low? On the contrary, data from radiotelemetry studies suggest that pronghorn utilize these areas frequently.

11) Page 19, Lines 15-18: The BA refers to the USAF procedure of "biological monitoring" -- put into place in response to Defenders' 60 day notice letter -- which, it is argued, is intended to "minimize the probability of death or injury to pronghorn" by having a USAF biologist survey H.E. Hill on South-TAC prior to any ordnance deliveries. Along with Dr. Christine Maher of Montana State University - Billings, I have witnessed the biological monitoring efforts the USAF has begun on South-TAC, near H.E. Hill. We both agree that these efforts are inadequate for several reasons: they are inadequate to determine that pronghorn in the area are spotted; they are inadequate to determine that the area is "clear" for the entire day of bombing exercises that may take place; looking for radio collared animals allows one to say whether or not the 8 collared animals are in the area, but nothing about the other 70 or more animals estimated to be in the population and out there somewhere.

12) Page 19, Lines 19-20: The BA further states that "no ordnance deliveries have been aborted" since the monitoring efforts were started in June 1996. However, according to the USAF's own documents, it does not even conduct a survey for pronghorn before each bombing run. Thus, a report from the USAF dated 15 July 1996 reflects that the biologist was unable to reach the South-TAC Range due to high water. The biologist radioed to let Range Operations know that he could not complete the survey prior to the live-drop missions that had been scheduled for that day, but was told that "Range Operations personnel had been instructed not to get involved in requests for rescheduling missions" -- i.e., the bombing was nevertheless conducted. The next survey report is dated 16 July 1996. This report states that the biologists got their vehicle stuck on the way to perform the

survey and were not able to get their vehicle out until "0800 hours," and that "South Tactical Range had become active at 0700 while we were waiting for assistance." Obviously, even when the inadequate biological monitoring survey cannot be conducted, the USAF does not deem it necessary to abort live-drop missions to protect an endangered species.

13) Page 20, Lines 3-13: This is a case where the lack of solid scientific evidence on the potential negative effects of low-level military overflights on Sonoran pronghorn is assumed by the authors of the BA to mean that there are no effects, therefore no mitigation is necessary. The study by deVos (1989) has some major flaws, one of which the BA has already pointed out: that the pronghorn captured for radiocollaring were not randomly distributed throughout the study area, and may have severely biased where future locations were detected. Our opinion is that peer-review would have pointed this out and greatly diminished the conclusions reached with such a limited data set. The assertion that other studies suggest that large mammals habituate rather quickly to overflights is tenuous at best, given the study design of those "research" efforts. For example, the Weisenberger et al. (1996) study used captive born, penned animals and **simulated** aircraft noises to make conclusions about how free-ranging animals would react to **real** low-level aircraft. The Workman et al. (1992) report is very unreliable since all the authors conclusions, are based on observations of, at most, four individuals. One must remember that one of the most basic scientific caveats is "Beware the sample size" (i.e., too big and one can almost always find a significant difference, and too small and one can almost never find a significant difference). The Krausman et al. (1993a,b) studies are also unreliable and inconclusive if one wishes to make some prediction about how wild populations of free-ranging wildlife will react to real low-flying aircraft. Krausman et al. (1993a) utilized a sample size of three in the study looking at heart rate. The Krausman et al. (1993b) study used captive born and raised animals, in captive pens, with simulated aircraft, all of which is completely opposite what "real" wildlife would represent.

14) Page 20, Lines 15-23: To suggest that similar effects are likely from low-level overflights by "small fixed-winged aircraft" and F-16's is a little like suggesting a human would be similarly affected by standing next to a Lexus automobile at idle speed and standing in the front row of the Indianapolis Motor Speedway during the Indy 500! Yes, low-level overflights have occurred since 1941, but the aircraft have changed. In addition, each new generation of pronghorn must deal with these adverse impacts (I assume that the BA authors are not suggesting that a female pronghorn tells her offspring "do not worry about those planes, they are just playing"). It only takes one instance of fleeing from a low-level overflight to inflict harm or harassment.

15) Page 21, Lines 8-10: Again there is absolutely no scientific evidence for the conclusion that "all the individuals in the existing U.S. Sonoran pronghorn population have probably been exposed to aircraft overflights ... and are likely to have become habituated." Nor is there any scientific evidence provided for the statement that, "the greatest potential for impacts from overflights are probably from low level flights by small fixed-wing aircraft and helicopters." Moreover, even had some pronghorn "habituated" to some of these activities, I am aware of no study demonstrating that habituation necessarily means that the stressors are no longer having an adverse effect on the animals.

16) Page 21, Lines 19-20: The BA suggests that "pronghorn probably habituate to ordnance noise" with no reference to any study or other evidence to support this conclusion. The BA further suggests that if they do not habituate to ordnance noise "they probably avoid the areas, which may result in an indirect loss of habitat." Based on data from the telemetry work by Arizona Game and Fish Department, however, we know that, in fact, pronghorn are not avoiding ordnance areas, and there may be as many as 15-20% of the population in these areas at any given time. This statement is also troublesome because although it suggests that avoidance would result in a loss of habitat, the BA offers no discussion regarding the adverse impacts of such a loss of habitat or measures intended to offset this loss.

17) Page 22, Lines 20-24: Again, the authors of the BA seem to think that because there have been no reported deaths or injuries on the range since 1941, no mitigation measures or changes in activities are required. This completely ignores the fact that nobody has been out there looking for pronghorn deaths and injuries. We know that pronghorn utilize these areas, that pronghorn can be killed or injured by these activities, and that the USAF continues to perform these activities in denial of their obligations to protect this endangered species.

Conclusion

I trust this information will prove helpful in the FWS's assessment of the BA and consideration of the relevant issues in formal consultation. In my professional opinion, based on all the information I have reviewed, the FWS should not concur in the BA's conclusion that USAF activities are not likely to adversely affect the Sonoran pronghorn. To the contrary, I believe that there can be no doubt that USAF activities are jeopardizing the continued existence of the Sonoran pronghorn, and that the Air Force must cease such activities during the consultation process to avoid further detrimental impacts to this species.

Should you need any additional information, please feel free to contact me at any time.

Sincerely,

Dennis A. Hosack, Ph.D.
Conservation Biologist

cc: Nancy Kaufman, USFWS Region 2, Regional Director
Bruce Palmer, USFWS Arizona Ecological Services, Section Coordinator for Birds and Mammals
Bill Austin, USFWS Arizona Ecological Services, Fish and Wildlife Biologist
Col. David L. White, USAF Luke USAF Base, Director of Range Management (without attachments)

References

Arizona Game and Fish Department. 1981. The Sonoran pronghorn. Special Report Number 10. Arizona Game and Fish Department, Phoenix, AZ.

Carr, J.N. 1970. Endangered species investigation. Sonoran pronghorn.

Dames and Moore. 1995. Biological assessment for the Marine Corps use of the Barry M. Goldwater Range.

deVos, J. C. 1989. Evaluation of Sonoran pronghorn movements around military activity sites on Barry M. Goldwater USAF Range. Arizona Game and Fish Department, Phoenix, AZ.

deVos, J. C. 1990. Selected aspects of Sonoran pronghorn research in Arizona and Mexico. Pages 46-52 in: Managing Wildlife in the Southwest Symposium, P. R. Krausman and N. S. Smith (eds.). Tucson, AZ.

Geraghty & Miller, Inc. and SWCA, Inc. 1996. Biological assessment for Sonoran pronghorn on the Barry M. Goldwater Range.

Hervert, J. J., R. S. Henry, M. T. Brown, D. W. Belitsky, and M. E. Kreighbaum. 1995. Sonoran pronghorn population monitoring: progress report. Technical Report 98, Arizona Game and Fish Department, Phoenix, AZ.

Hughes, K. S. and N. S. Smith. 1990. Sonoran pronghorn use of habitat in southwest Arizona. Final Report Number 14-16-009-1564 RWO #6. Arizona Cooperative Fish and Wildlife Research Unit, Tucson, AZ.

Krausman, P. R., M. C. Wallace, M. J. Zine, L. R. Berner, C. L. Hayes, and D. W. DeYoung. 1993a. The effects of low-altitude aircraft on mountain sheep heart rate and behavior. University of Arizona, Tucson, AZ. 134pp.

Krausman, P. R., M. C. Wallace, M. E. Weisenberger, D. W. DeYoung, and O. E. Maughan. 1993b. Effects of simulated aircraft noise on heart rate and behavior of desert ungulates. University of Arizona, Tucson, AZ. 70pp.

Manci, Karen, et al. 1988. Effects of aircraft noise and sonic booms on fish and wildlife: Results of a survey of USFWS endangered species and ecological services field offices, refuges, hatcheries and research centers.

National Park Service. 1995. Report on effects of aircraft overflights on the National Park System.

Snow, T.K. 1994. Sonoran pronghorn aerial summary 1992-1994.

U.S. Fish and Wildlife Service. 1982. Sonoran pronghorn recovery plan. U.S. Fish and Wildlife Service, Albuquerque, NM.

U.S. Fish and Wildlife Service. 1994. Revised recovery plans for the pronghorn. U.S. Fish and Wildlife Service, Albuquerque, NM.

U.S. Fish and Wildlife Service. 1996. Biological opinion for existing and proposed activities by the Marine Corps Air Station.

Weisenberger, M. E., P. R. Krausman, M. C. Wallace, D. W. DeYoung, and O. E. Maughan. 1996. Effects of simulated jet aircraft noise on heart rate and behavior of desert ungulates. Journal of Wildlife Management, 80: 52-61.

Workman, G. W., T. D. Bunch, J. W. Call, F. C. Evans, L. S. Neilson, and E. M. Rawlings. 1992. Sonic boom/animal disturbance studies on pronghorn antelope, Rocky Mountain elk and bighorn sheep. Utah State University Foundation, Logan, UT.

Wright, R. L. and J. C. deVos. 1986. Final report on Sonoran pronghorn status in Arizona. Contract Number F0260483MS143. Arizona Game and Fish Department, Phoenix, AZ.

Zar, J. H. 1984. Biostatistical Analysis. Prentice-Hall, Inc., Englewood Cliffs, NJ.

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Access & Excellence

15 October 1996

Mr. John Rogers, Director
U.S. Fish and Wildlife Service
1849 C Street, NW
Washington, DC 20240

Re: Review of Air Force's Biological Assessment for Sonoran Pronghorn on the Barry M. Goldwater Air Force Range

Dear Mr. Rogers:

In response to a request from Defenders of Wildlife, I have reviewed and evaluated the Air Force's recent Biological Assessment ("Assessment") for Sonoran Pronghorn on the Barry M. Goldwater Air Force Range ("Goldwater Range" [Geraghty and Miller, Inc. and SWCA, Inc. 1996]). The purpose of the Assessment was to determine whether Air Force activities on the Goldwater Range, including inert and live bomb delivery, missile delivery, strafing activities, and low-level overflights, may adversely affect the survival and viability of critically endangered Sonoran pronghorns.

Despite the requirements for biological assessments contained in the Endangered Species Act, this Assessment did not provide any semblance of substantive or rigorous analysis of the probable impact of Air Force activities on pronghorns. Instead, the Assessment provided an inadequate and limited examination of the relevant biological, ecological, physiological, and behavioral impacts of these activities on Sonoran pronghorns. The Assessment relied on unsubstantiated statements and flawed or irrelevant studies to conclude Air Force activities are not likely to adversely affect pronghorns. The scope, breadth, and content of the Assessment clearly suggest it was prepared without careful analysis or consideration, presumably in response to the threats of litigation lodged by Defenders of Wildlife.

Based on my review of the Sonoran pronghorn literature, my specific knowledge of pronghorn biology, ecology, behavior, and physiology, and my personal visit to the Goldwater Range, my professional opinion is that Air Force activities on the Goldwater Range are clearly resulting in a "take" of this endangered species through harassment and harm, as those items are defined under the Endangered Species Act and the Fish and Wildlife Service's regulations.

No other conclusion could be made, considering the available information about the type and extent of Air Force activities practiced on the Goldwater Range and the irrefutable evidence that pronghorns routinely occupy portions of the range where bombing, strafing, and low level overflights are frequent and routine. Given the critically imperiled status of this subspecies, the population's low reproductive rate, and a potentially high rate of

ATTACHMENT B

mortality, Air Force activities must be halted immediately, pending a more substantive and thorough analysis of potential impacts to the pronghorns.

Qualifications and Experience:

Prior to engaging in a detailed discussion of the Assessment and pronghorns, I would like to briefly review my relevant educational and professional expertise on this matter to demonstrate that I am eminently qualified to review and evaluate the Assessment. I am presently an Assistant Professor of Biology at Montana State University - Billings (MSU-Billings). I teach the zoology and ecology portions of organismal biology, and I also have taught courses in behavioral and evolutionary ecology, vertebrate zoology, and environmental ethics. In addition to my work at MSU, since April, 1996 I have served as the Curator of Behavior at ZooMontana.

I received my Doctor of Philosophy degree in Animal Behavior (with emphasis in Ecology and Evolution) from the University of California at Davis in June, 1992. The title of my dissertation was "Variable behavior of pronghorn (Antilocapra americana): flexibility in male social organization and female group stability."

Prior to, and since receiving, my Ph.D., I have been involved in numerous field studies of American pronghorns. I continue to conduct field research on the behavior and ecology of pronghorn populations near Billings, Montana and on the Fort Belknap Indian Reservation. As a result of my research, I have authored or coauthored four papers on pronghorn behavior and ecology and two papers on vertebrate territoriality. In addition, I have authored or coauthored nineteen presentations/abstracts/posters on my pronghorn research findings. These publications are listed on my curriculum vitae (See Attachment 1).

In addition to my own research into the ecology, biology, behavior, and evolution of pronghorns, I have reviewed the scientific literature on these subjects, attended various conferences and seminars at which pronghorn issues were discussed, and engaged in discussions with fellow scientists involved in the study of pronghorns. More specifically, my knowledge of Sonoran pronghorns is based on a review of the relevant scientific literature, various plans and environmental compliance documents pertaining to pronghorns, discussions with professional colleagues, and a visit to the Goldwater Range on 20 August 1996.

With this background, I offer the following specific comments on Sonoran pronghorns and the adequacy of the analysis contained in the Assessment.

General Comments on Sonoran Pronghorns, the Potential Impact of Air Force Activities on their Survival, Viability, and Recovery, and the Adequacy of the Biological Assessment:

As previously stated, Air Force activities on the Goldwater Range that are potentially harmful to pronghorns include dropping live and inert bombs, missile delivery, strafing, and low-level overflights. Except for the low-level overflights, which occur within various designated air routes over the Goldwater Range and adjacent lands, the Air Force activities that are of greatest threat to the pronghorns, including bombing, missile delivery, and strafing, are limited to the South, North, and East tactical ranges ("STAC," "NTAC," and "ETAC," respectively). Live-bombing areas theoretically are further restricted to the High Explosive or H.E. Hills located on each TAC. Although the frequency and extent of strafing activities are not known, bomb and missile delivery on NTAC, STAC, and ETAC occurs

year-round except for approximately two months on each TAC, during which time such activities are halted to permit ordnance clean-up.

Based on information contained in the Assessment, telemetry data collected from radio-collared pronghorns[1], and various other documents that I have reviewed, Sonoran pronghorns unquestionably use both NTAC and STAC and have been known to use these sites since at least 1983. While the 1995 and 1996 telemetry data indicate pronghorns are more likely to be found on NTAC and STAC between February and July and from September to mid-December, based on their presence in the area and the kind of habitat pronghorns use, pronghorns may reside on or in the vicinity of both TACs during the entire year.

In fact, deVos (1989, 1990) determined that Sonoran pronghorns are found more frequently within 1,600 meters of a military zone (i.e., NTAC or STAC) than expected if they randomly used the area. This probably reflects a difference in habitat quality within the study area and the importance of a particular habitat type or topographical feature (i.e., bajadas, valleys) on or near military use zones. A pronghorn may be so reliant on areas close to military zones due to a particular habitat feature, possibly even a feature created by Air Force activities (i.e., craters filled with water), that it was unwilling to abandon the habitat in response to Air Force activities. This does not suggest the animal did not experience increased stress, demonstrate flight behavior, or experience any other direct or indirect effects as a result of Air Force activity.

Topographical features common to both NTAC and STAC may be attractive to pronghorns. For instance, pronghorns generally prefer to rest or bed down on the slopes of hills (referred to as bajadas in the Sonoran pronghorn literature) perhaps because such areas maximize visibility (AGFD 1981) and facilitate the animals' ability to detect approaching predators, including bobcats and coyotes. On NTAC and STAC, since bombing activities have effectively caused the hills to be barren of vegetation and eliminated concealed predator approach routes, the hills and slopes are perfectly suited as pronghorn resting and bedding areas. Bajadas have also been reported to be important areas for fawning (USAF 1991). However, the hills are also precisely where the Air Force drops live bombs during its training activities. Thus, the attractiveness of these sites to pronghorns puts them directly in harm's and possibly death's way due to Air Force bombing activities.

Air Force bombing activities have also created large craters on and near the H.E. Hills on both NTAC and STAC which, during the wet season, fill with water and are, according to the Assessment and other documentation I have reviewed, used by pronghorns for

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[1]The telemetry data referred to throughout this letter have been collected since January, 1995 as part of a population monitoring project coordinated by the Arizona Game and Fish Department. In November and December, 1994, 22 Sonoran pronghorns (18 females and 4 males) were captured and outfitted with radiocollars. Radiocollared animals were then tracked, nearly every week, from the air beginning in January, 1995 and continuing to the present. I understand that since this project began, 14 (or approximately 64%) of the 22 radiocollared animals have died. The cause of death is unknown in the majority of the cases, although predation may have played a role in at least one death. The 1995 telemetry project was the third such project conducted since the early 1980s. Previous telemetry work was done in 1983 and 1987 (deVos 1989).

drinking, reportedly as often as twice per day (Hervert et al. 1995). While considerable scientific debate remains over the importance of standing water for pronghorns (compare AGFD 1981, Hughes and Smith 1991 with Wright and deVos 1986, Hervert et al. 1995), providing an artificial water source in an area repeatedly and routinely used for jet training, including low-level overflights, bombing, missile delivery, and strafing activities, substantially increases the risk of disturbance, harassment, and direct and indirect mortality of pronghorns that may be attracted to the area. The distribution of craters on STAC, in particular, and the density of vegetation surrounding these craters (which makes it difficult to detect the presence of pronghorns) substantially increase the likelihood that bombing occurs where pronghorns are present.

Given the presence of Sonoran pronghorns in these areas, Air Force bombing, missile delivery, strafing, and low-level overflights pose short and long term threats to these animals by disturbing or harassing pronghorns during feeding, resting, breeding, and fawning activities. For example, Air Force bombing and strafing activities may well result in the direct killing or wounding of pronghorns. The Air Force admits that this potential "definitely exists" (Assessment, Page 18) but then declares, without any support, that the probability of such an incident is "very low." The Assessment then claims there is no evidence that Air Force activities on the Goldwater Range have directly caused the death or injury of a pronghorn. However, the Air Force conducts no follow-up to its bombing activities to determine if a pronghorn has been killed or wounded. Without such a post-bombing evaluation, given that predators in the area are quick to consume available carcasses and injured animals, the Air Force simply cannot substantiate this claim. In fact, considering the large percentage of radiocollared animals killed in the past 21 months, some of these animals may have died, directly or indirectly, as a result of bombing and strafing activities on the TACs.

Even if the risk of direct harm or injury by a live bomb or bullet was minimal, low level overflights of jet aircraft, bombing, missile delivery, and strafing activity are likely to produce increased stress in the animals and a mild to severe flight response, resulting in increased expenditures of energy and, in turn, possibly reducing survival and reproduction. Even at 500 feet altitude, the minimum altitude for overflights on the Goldwater Range as reported in the Assessment (Page 20), negative impacts to pronghorns are still likely to occur. Such impacts are even more dangerous if they occur during droughts or when food resources are not abundant, since these conditions will preclude increased forage intake, causing animals to utilize body reserves and resulting in deterioration in their condition.

This flight behavior may occur in response to the intense noise of a high-performance aircraft engine operating at subsonic speeds and to the noise and fallout from exploding bombs. Whether the animals run 10, 100, or 1,000 m to escape the sound of the jet, bomb explosion, or strafing, critical energy stores are consumed in response to human-induced perturbations in the environment, while stress is increased. Although a single response can alter the energy balance in an animal temporarily, repeated exposures, which would be expected on NTAC and STAC, may result in an overall decrease in reproductive rates caused by increased stress and energy loss, an increase in abortions due to stress impacts on females in gestation, and an increase in fawn mortality through predation caused by separation of fawn from mother when fleeing from low-level overflight, bombing, missile delivery, and strafing activities. The Assessment, however, completely failed to consider any of these potential implications of military activities on the

bioenergetics of Sonoran pronghorns.

In addition, the Assessment did not contain any discussion of the potential implications of jet noise on pronghorn survival and reproduction. This is particularly troubling given that the Air Force, in conjunction with the U.S. Fish and Wildlife Service (FWS), published a report entitled "Effects of Aircraft Noise and Sonic Booms on Domestic Animals and Wildlife: A Literature Synthesis" (Manci et al. 1988).

Manci et al. (1988) revealed, among other things, that aircraft noise and sonic booms have been implicated, based on laboratory research with domestic species (particularly poultry), as a cause of lowered reproduction in a variety of animals. More critically, field studies indicate reproduction in wild species may be more affected by noise disturbance than domestic populations (Id. at Page 15). Given these and other potential impacts, it is no surprise that the 1994 Revised Sonoran Pronghorn Recovery Plan called for efforts to minimize the effects of military activities on pronghorns to facilitate their recovery (USFWS 1994, Page 29).

Manci et al. (1988) cite additional information that is directly relevant to the impacts of military activity on wild ungulates like pronghorns. For example, the authors state that sound levels above 90 decibels are likely to be aversive to mammals, and intermittent exposure to noise reportedly has a greater effect than continuous exposure. Not only are bomb explosions most assuredly louder than 90 decibels, but the timing and frequency of bombing activities on the Goldwater Range clearly are intermittent and, therefore, likely to result in a greater impact to pronghorns than exposure to a continuous noise. The seriousness of such impacts is influenced by a number of factors, including time of year.

For Sonoran pronghorns, for example, adverse impacts from these military activities are likely to be most prominent during the latter stages of gestation (when female pronghorns will be heavier and slower) and the first month after birth of the fawns when immaturity of the fawn and/or fawn-doe separation are most problematic. Sonoran pronghorns generally fawn during the first two weeks in March (Assessment, Page 17), precisely the same time period when, according to the telemetry sheets, radiocollared pronghorns (the majority of which are females), and specifically radiocollared female pronghorn #14, have been detected near H.E. Hill on STAC.

In fact, according to a March 12, 1996 letter from the U.S. Fish and Wildlife Service to the Air Force, on March 4, 1996 the Air Force initiated bombing practice on H.E. Hill at STAC only one day after pronghorns were observed bedding down at the site. To make matters worse, according to Table 2 in the Assessment (Page 12), the Air Force dropped 177 live bombs on NTAC during February and March, 1996 and 106 live bombs on STAC during March, 1996. These numbers correspond to nearly one-half of the live bombs dropped on NTAC between October and June, 1995 and over one-third of the live bombs dropped on STAC during that same period. Thus, during the two months (February and March) that are most critical for pronghorn reproduction, and ultimately for population survival and recovery, the Air Force is engaged in a bombing frenzy.

The Marine Corps, which conducts low-level overflights over the western portion of the Goldwater Range, considered fawning season impacts in its 1988 biological assessment (Dames and Moore 1988). It concluded that the likelihood of low-level aircraft/Sonoran

pronghorn encounters is low, but to avoid possible adverse effects to pregnant female pronghorns and young fawns, it recommended that such encounters be minimized (Hughes and Smith 1991). Considering that far fewer, if any, pronghorns use the Marine Corps portion of the Goldwater Range, this cautionary approach to low-level flight management would be of even greater importance and value on the eastern portion of the range. The Air Force's Assessment, however, provides no such precautionary recommendations.

These Air Force training activities are also likely to alter male pronghorn breeding success and behavior. During the rut or breeding season, dominant male pronghorns that engage in breeding assemble a group of females (Hughes and Smith 1991). Any disruption at this time, including loud noises or other activities which may cause pronghorns to flee, may break up the group, causing the male to expend energy in reassembling the group instead of breeding. The breeding season for Sonoran pronghorns peaks in July. This time period also coincides, according to telemetry data, with pronghorn use of H.E. Hill on STAC between May and August, 1995. Indeed, in June and early-July, 1995, two collared pronghorns were routinely detected on STAC during telemetry flights. The Assessment, however, did not examine the implications of low-level overflights, bombing, missile delivery, or strafing on the critical birthing or breeding seasons of pronghorns.

Such adverse effects are more pronounced when other stress factors are present. For Sonoran pronghorns, other stressors include the harshness of their habitat,[2] human development including road building that results in habitat loss and fragmentation, encounters with vehicular traffic when crossing roads, additional military activities conducted by the U.S. Marine Corps and National Guard troops, and predation.[3]

Considering the high percentage of radiocollared animals that have died in the past 22 months, if military activities are not responsible for this mortality, other extremely potent stressors (such as those identified above) are affecting this population dramatically. Based on my professional expertise, stress associated with military activities on the Goldwater Range (the stressor most easily remedied with the least ecological damage), when added to other stress factors, may result in severe adverse effects to the population and may be detrimental to the population's long-term health and viability. In fact, I believe, as stated in Manci et al. (1988), that "prolonged exposure to severe stress may exhaust an animal's resources and result in death" (Page 14).

The impact of Air Force activities to surviving Sonoran pronghorns is magnified due to the critically endangered status of the population. I understand, as previously

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[2]Hughes and Smith (1991), for example, stated that "pronghorns may have to travel longer distances and move more often to obtain life requirements in this habitat than in others," and that "males may also have to travel further during the breeding season because of the seemingly patchy distribution of pronghorn groups and the low number of pronghorns" (Page 32). Such additional movements will affect the bioenergetics of a particular animal, reducing the animal's energy surplus, and thus making it more susceptible to human-caused perturbations.

[3]During the 1960s the Cabeza Prieta National Wildlife Refuge was subjected to intensive predator control utilizing Compound 1080, with no recorded beneficial effect on the pronghorn population.

indicated, that only 8 of the 22 pronghorns originally radiocollared in November/December, 1994 remain alive today. If this 64% mortality rate over the course of 22 months in the radiocollared animals reflects the mortality rate in the general population, then the population trend is demonstrably downward, and the species' survival is of critical concern.

The seriousness of this downward trend in pronghorn numbers is even more pronounced in light of the limited productivity exhibited by radiocollared female pronghorns. I understand that, in 1996, only one of 8 radiocollared female pronghorns alive at that time produced a fawn.[4] This amount of production falls far short of the level of productivity needed to sustain a population. If this level of productivity in radiocollared pronghorns is reflected in the uncollared segment of the population, then the downward spiral in population numbers is likely to become even more pronounced in the near future. If recruitment of breeding age females into the population is similarly low, the lack of viability in the Sonoran pronghorn population may be even more serious than is presently believed.

While the impact of low-level overflights is likely to affect a larger area and a larger number of animals than bombing, missile delivery, and strafing activities, which may cause more localized impacts, all three activities pose a threat to the survival and viability of individual pronghorns and the population as a whole. Again, in contrast to other stressors on the population, Air Force activities are the most easily remedied of all the limiting factors.[5]

General Comments on Adequacy of Air Force Pronghorn Monitoring Effort:

In June of this year, in response to concerns raised by Defenders of Wildlife, the Air Force apparently increased its efforts to detect pronghorns on STAC before a bombing run. This effort consisted of an Air Force official inspecting H.E. Hill on STAC and surrounding lands each morning of each day when bomb dropping activities were scheduled. The inspection involved driving around H.E. Hill, stopping at six or seven locations, and using telemetry equipment and/or binoculars in an attempt to locate or observe pronghorns on or near the hill. According to the Air Force, if pronghorns were spotted on or within one mile of the hill, bombing would not be conducted that day.

Based on my personal inspection of STAC and my knowledge of pronghorn behavior, movements, and ecology, the Air Force's limited monitoring efforts are completely inadequate to protect Sonoran pronghorns in the vicinity of H.E. Hill on STAC from disturbance, harassment, and even mortality as a consequence of Air Force activities.

First, I note that the Air Force's pronghorn detection efforts are limited to missions that involve dropping live bombs on STAC. No such efforts are made before low-level overflights, strafing activities, or when dropping practice (inert) bombs on STAC, nor are any such efforts made in response to any military activities on NTAC, despite the fact that pronghorns are known to occupy that site, also.

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[4]That female was subsequently found dead, presumably the result of predation. The fate of the fawn is unknown.

[5]I understand several alternative locations for Air Force training activities are readily available.

Second, while pronghorns typically demonstrate a crepuscular activity pattern (i.e., they are most active around dusk and dawn), pronghorn movements may occur at any time of the day or night. Even in a harsh climate like that experienced in southern Arizona, pronghorns may be active at any time, including during the hottest part of the day. A one-time inspection of H.E. Hill and surrounding lands on STAC in the morning when bombing activities are planned will not ensure that pronghorns have not moved onto STAC or H.E. Hill later in the day, possibly during a gap in overflight, bombing, missile delivery, or strafing activities.

Third, telemetry surveillance of H.E. Hill and surrounding lands on STAC for the presence of pronghorns is simply not adequate to detect the presence of pronghorns in the area, since so few animals in the population currently are radiocollared (8 of approximately 80-100).

Fourth, visual observation, with or without binoculars, is not effective in detecting the presence of pronghorns, due to the type and density of vegetation found at the base of H.E. Hill. In fact, given the density of vegetation and the concealment ability of pronghorns, a person is unlikely to detect pronghorns in the vicinity of H.E. Hill by simply glassing the area from the back of a truck at select locations around the hill. Moreover, visual observation is not possible at night when, according to documents I have reviewed, some low-level overflights and bombing activities also occur.

Fifth, the Air Force monitoring effort also includes flyovers to look for pronghorns that may be present on or near H.E. Hill on STAC. Like other components of the Air Force's new monitoring effort, such flyovers will be ineffective in detecting pronghorn presence. For example, I have experienced difficulty finding radiocollared pronghorns from a Cessna aircraft flying at low altitude and low speed in an area where the animals were definitely present due to, among other things, their coloration and ability to blend into their environment. Therefore, I cannot fathom how a pilot in an aircraft flying at tremendous speed would possibly be able to spot one or more pronghorns on or near H.E. Hill on STAC.

In the Assessment, the Air Force admits its bombing activities could result in direct death or injury to pronghorns. Nevertheless, the Air Force assumes its monitoring efforts assure pronghorns will not be present during live bombing. However, considering the serious deficiencies with the Air Force's monitoring efforts as enumerated above, the Air Force simply has no sound basis for asserting that pronghorns are not present in the area when bombs are dropped and strafing activities are conducted. The current monitoring efforts are simply not sufficient in scope or frequency to detect the presence of uncollared pronghorns in the vicinity of H.E. Hill due to the density and height of vegetation.

Moreover, I have recently reviewed Air Force memoranda documenting the results of some pronghorn monitoring trips and learned that, on at least one occasion, the Air Force biologist did not conduct the monitoring due to inclement weather; bombing training was, nevertheless, permitted on that day. Thus, no effort was made to ensure pronghorns were not present in the area.

Evaluation and Critique of Specific Studies Relied Upon in the Biological Assessment to Demonstrate Minimal Impact of Air Force Activities on Sonoran Pronghorns:

Despite the enormity of potential impacts to pronghorns from the Air Force

activities described above, the Assessment states "no evidence indicates that military activity has affected the size or distribution of Sonoran pronghorns and no deaths or injuries to pronghorns as a direct result of military activity are known to have occurred..." (Page 17). This conclusion, however, is not supported by the available evidence, the scientific literature, or common sense.

Far from representing a thorough analysis of the impact of Air Force activities on the pronghorn, the Assessment, in my professional and expert opinion, is a hastily prepared document, built on an extremely weak and limited scientific foundation, lacking supporting evidence for many of its factual representations, and designed to substantially downplay the impact of military activities on the Sonoran pronghorn in order to justify continuation of Air Force training activities despite critical impacts to a species on the brink of extinction.

For example, the Assessment suggests the Sonoran pronghorn population has not declined in numbers, and it is the same size now as in the past (Page 14). While the historical data on population size are sparse and inconclusive, considering pronghorn ecology, habitat needs, habitat conditions, productivity potentials, and historic range size, it is inconceivable that the historic Sonoran pronghorn population was not larger, perhaps by hundreds, if not thousands, of animals, than the current population. As explained by Wright and deVos (1986), a decline in Sonoran pronghorns since 1924 did not prompt federal listing, but rather the dramatic decrease in numbers in the half century prior to that date warranted their listing.

An examination of the literature cited in the Assessment, in fact, demonstrates the quantity and quality of Sonoran pronghorn habitat in both Mexico and Arizona have substantially declined. The critical factors that effectively reduced available habitat for pronghorns include drying of the Gila River in Arizona and the Rio Sonoyta in Mexico due to an increase in farming and irrigation practices, cattle grazing on the Organ Pipe Cactus National Monument and Goldwater Range, and conversion of land to agriculture (Carr 1971, 1972; AGFD 1981; Wright and deVos 1986). Cattle, which also may have competed with pronghorns for water, were not removed from pronghorn range until the early 1980s. These developments caused general drying of the area as well as reduction in available vegetation, resulting in degradation of the quality of habitat available to pronghorns (Wright and deVos 1986). In fact, AGFD (1981) stated the Gila and Rio Sonoyta Rivers once may have provided a valuable water source and abundant forage and cover for Sonoran pronghorns.

This degradation in vegetation quality and abundance led Wright and deVos (1986) to conclude that "poor range conditions still appear to be the leading cause in the decline in Sonoran pronghorn numbers" (Page 13). If the pronghorns' range condition remains in poor quality, this further elevates the potential impact of the Air Force's activities on pronghorns due to cumulative impacts on quality, quantity, and use of available habitat. Moreover, in poor quality habitat, pronghorns are more nutritionally stressed than in higher quality habitat. As a result, cumulative effects of Air Force activities may result in even greater impacts on pronghorn energy use.

Moreover, evidence from other pronghorn subspecies demonstrates that pronghorn numbers decline exponentially in the face of increased human development, use, and alteration of pronghorn habitat. The habitat degradation, development, land conversion,

and road building that has occurred in Sonoran pronghorn habitat have reduced the amount of habitat, produced substantial fragmentation of remaining habitat, and severed links between U.S. and Mexican populations of Sonoran pronghorns. Based on these circumstances, the size of Sonoran pronghorns in Arizona undoubtedly is reduced, probably substantially, from historical levels.

The Assessment also severely downplays the impact of noise and operation of jet aircraft on Sonoran pronghorns. Instead of critically evaluating such impacts, including impacts during the important breeding and birthing months, the Assessment concludes such intrusions are not likely to adversely affect pronghorns, because they have "habituated" to military activities on the Goldwater Range (Page 21). In other words, the Assessment claims pronghorns have become so used to military activities that they no longer react to the noise or impacts of these activities.

In support of this argument the Assessment cites deVos (1989), Krausman et al. (1993a, b), Weisenberger et al. (1996), and Workman et al. (1992). An evaluation of these studies, however, reveals specific methodological flaws that effectively eliminate the applicability of these findings to the circumstances relevant to Sonoran pronghorns. It is important to note up front that none of these studies addressed the direct or indirect impacts of bombing, missile delivery, or strafing activities on the study animals.

In addition, the deVos study (1989) involved tracking several radiocollared pronghorns by aircraft over many years. The flights, however, were only conducted on weekends when the demand for military flights was generally lightest. Given the ability of pronghorns to move a considerable distance in a relatively short amount of time, weekend flights may not provide a clear picture of the impact of military activities on pronghorns. Moreover, as deVos admits, the Air Force provided no information on frequency of use, kind of use, or even if the study sites were in use, thus raising serious questions regarding the true impact of military use on pronghorns.

Similarly, the applicability of the findings of Krausman et al. (1993a) and Weisenberger et al. (1996), which were essentially the same study published in different forums, to Sonoran pronghorns is also highly questionable. Several critical differences between the methodology used in this study and the circumstances pertinent to the Sonoran pronghorn were not identified in the Assessment. For example, the animals used in the study were captive born mountain sheep and mule deer maintained in pens. The noise of a jet overflight was recreated using a sound system. Moreover, only 11 animals (a very limited sample size) were used in the study, and heart rate and observational data were not recorded for all animals during all experimental trials. In addition, several heart rate transmitters failed due to lead breakage and body fluid leakage, reducing the amount of data collected on physiological impacts. Given that the study was designed to assess sheep and deer physiological and behavioral responses to low level overflights, these methodological issues are quite critical to the results.

Desert mule deer, mountain sheep, and pronghorns are different species that generally occupy different habitats and that may demonstrate different responses to human-induced perturbations to their environment. For example, although free-ranging mule deer and bighorn sheep may become "beggars" as a result of tourists feeding them, free-ranging pronghorns never habituate to human presence to this degree. Moreover, captive-

born animals maintained in captivity behave differently than their free-ranging counterparts. Their behavioral and physiological reactions to the roar of a jet engine emanating from a large speaker may be different from the reactions of wild animals. In addition, the fact that the source of the negative stimuli is stationary verses mobile may also affect the animal's response, since the trigger for such a response may include visual movement of the stimuli. Given these shortcomings, the authors unsurprisingly recommended that future research incorporate free-ranging ungulates and actual aircraft (Weisenberger et al. 1996).

The findings contained in these studies, therefore, cannot and should not be applied to wild, free-ranging animals. Furthermore, even if such a correlation could be made, these studies did not consider long term effects (e.g., productivity and recruitment) of low-altitude aircraft noise on these captive animals or the direct and indirect implications of bombing, strafing, and missile delivery on pronghorn survival. These are crucial biological considerations when one is assessing the magnitude of harm to critically endangered species, such as Sonoran pronghorns.

The results reported by Workman et al. (1992) are also problematic and are not consistent or comparable to the impact of Air Force activities on free-ranging Sonoran pronghorns. First, pronghorns used in this study had been maintained in captivity for a time before the experiment was initiated. As discussed above, the effect of captivity on the behavior of pronghorns is likely to have influenced behavior and biased study results.

Second, the experiment on the impact of subsonic overflights on pronghorns only used two animals, and the maximum sample size used in the entire study was four animals. Such an extremely limited sample size simply cannot form the basis for any sound biological conclusions concerning the applicability of these research findings to an entire free-ranging pronghorn population.

Third, the aircraft altitude at which the subsonic overflights were conducted (5,000 feet) does not come close to approximating the altitude at which subsonic flights are routinely practiced on the Goldwater Range (i.e., according to the Assessment, low-level overflights are conducted at a minimum of 500 feet altitude). Moreover, despite this high altitude, the limited heart rate data collected demonstrated an increase, sometimes a substantial one, in pronghorn heart rate in response to overflight activity. This increase was followed by either an immediate or gradual decrease of heart rate to near pre-exposure levels. Regardless of what happened after exposure, these results demonstrate that jet overflight, at considerably higher altitudes than what is practiced at the Goldwater Range, produced substantial heart rate increases. Such increases correspond to increased stress on individual animals, regardless of their external behavior (i.e., flight response).

Although the limited sample size makes heart rate data from the study difficult to correlate to free-ranging pronghorns, Workman et al. (1992) reported that heart rate response in individual animals generally decreased in intensity with multiple exposures to the same stimuli. These exposures, however, occurred within relatively close time intervals (no less than 30 minutes apart) and all within a few hours. These results provide no meaningful examination of likely pronghorn response to jet aircraft overflights that may vary in frequency over days, weeks, and months. In other words, animals that may show a decreasing intensity of heart rate response to multiple exposure events during a

limited time period might demonstrate a substantial response to the same type of exposure if one or two days separate exposure events.

Finally, Workman et al. (1992) did not analyze their data statistically. Indeed, they could not rigorously subject their data to inferential statistical tests because sample sizes were too small. In addition, the amount of variation within the same individual and between different individuals was quite large, as indicated by numerous figures in their report. That variation probably would swamp any possible effects, negative or otherwise, of the treatments. Any conclusions based on four animals exhibiting such large amounts of variation must be treated with extreme caution.

Krausman et al. (1993b) was the most relevant of the studies cited in support of the Air Force's "habituation" argument, but this study also utilized certain methodologies that severely reduce the applicability of its conclusions to the present situation. For example, this study involved mountain sheep housed in a 320-hectare enclosure. Mountain sheep and Sonoran pronghorns, as indicated previously, occupy different habitats and may very well respond differently to disturbances. The fact that the study animals were maintained in an enclosure, although it was substantially larger than other studies cited previously, also may have biased research results.

In addition, like the other cited studies, the sample size of animals used to detect changes in heart rate in response to low level overflights was limited, in this case, to only 3 animals, and the number of animals observed per overflight was limited to one. Such a sample size is patently too small to provide any meaningful scientific data. Interestingly, even recognizing these limitations, the authors reported "acute changes in behavior of mountain sheep" (Page 85) in response to flyovers by F-16 aircraft. These changes, which frequently involved running for <10 m, were reportedly less than "those recorded for sheep running from other aircraft" (Page 82), yet the authors failed to explain why their results were different from previous results[6] and then summarily dismissed the impacts as inconsequential. If such a response was demonstrated by an animal on an infrequent basis, perhaps the impact is insignificant. However, if the response was routine and occurred somewhat frequently over the course of an entire year (i.e., the circumstances facing Sonoran pronghorns), the impact to the animals' energy reserves and productivity may be more substantial.

Krausman et al. (1993b) also report low-level overflights "were not detrimental to productivity and recruitment" (Page 83). The study, however, did not examine long term implications of repeated harassment and stress on productivity, nor did it address what role predation played, if any, in regulating population size or affecting behavior of the sheep population within the enclosure. If predators were not able to access the pen or were not active in the area, then lamb survival should be higher than survival in a free-ranging population. Thus, without assessing other variables that may have influenced the productivity estimate, the veracity of the study's conclusions about production is highly questionable.

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[6]One possible explanation is that the bias introduced by confinement in the enclosure may have provided the animals with an artificially enhanced level of security that does not exist in wild populations.

Finally, both studies by Krausman et al. (1993a, b) and the republished report by Weisenberger et al. (1996) contain statistical errors that render their conclusions suspect. Specifically, although the sample size was only 11 animals (Krausman et al. 1993a; Weisenberger et al. 1996) and 12 sheep (Krausman et al. 1993b), sample sizes reported in the tables and their statistical analyses were much higher. This indicates the authors pooled their data. A primary assumption of all statistical tests is that the data are independent. By lumping together multiple data points from multiple animals, that assumption is violated, and the statistical results are unreliable. A major problem with pooled data is that one individual's responses perhaps may inflate the overall population's response because that individual contributes unequally to the data set. For example, an individual may demonstrate a lower heart rate compared to other individuals; if that individual's data represent 70 out of 100 data points in the analysis, the results will be misleading and not representative of the actual effects of the treatment on the population. The authors should have calculated one mean for each individual animal and conducted analyses of those means.

While habituation may occur in some animals under some conditions, no sound scientific evidence shows that Sonoran pronghorns have become habituated to military activities on the Goldwater Range. The mere fact that an extremely small population of the subspecies has survived since 1941 in an area where low-level overflights, bombing, missile delivery, and strafing are routine, and where the frequency of such activities and the technology employed has so drastically changed in the past half century, does not mean the subspecies has "habituated." Rather, development, land conversion, and road building may have forced pronghorns to survive in this particular area, i.e., they have nowhere else to go. However, this does not suggest pronghorns are not adversely affected by military activities. In fact, the severe decline in the population may be due, in some degree, to the impacts of increased stress and energy expenditures caused by military activities on the breeding behavior and success of pronghorns.

In fact, in my own experiences tracking pronghorns from aircraft, despite frequent and repeated flights at 200 to 1,000 feet in altitude, I have yet to observe habituation in my study animals. When I was able to locate radiocollared animals in my study group, they were almost always exhibiting flight behavior in response to the visual and auditory stimulus of the aircraft. Considering that the sound emanating from a jet engine is substantially louder than that emanating from the engine of a small Cessna, a jet is more likely to generate a startle or fright response due to the noise produced by the jet engine. In turn, this response will result in an increase in energy expenditure with the associated potential detrimental impacts.

Moreover, even assuming that some level of habituation has occurred in Sonoran pronghorns (a conclusion that simply cannot be made based on the current scientific evidence), this does not eliminate potential adverse impacts on this subspecies. Even a habituated animal that does not flee from a recognizable sound may experience an increased heart rate and increased stress as a result of such stimuli. Indeed, according to Manci et al. (1988), little is known of the long term effects, including stress, of noise on the physiology of wild ungulates. As previously noted, however, behavioral changes resulting from exposure to sudden or loud noise, such as sustained running or avoidance behavior, cause increased expenditures of energy, which can reduce the rate of survival and reproduction.

Based on the foregoing analysis, the scientific studies relied upon by the Air Force to dismiss potential impacts of its activities on the Sonoran pronghorn fail to provide any substantive evidence to justify the Air Force's claims. The Air Force must not use the lack of valid, site-specific data on the effects of its activities on pronghorns to justify a continuation of such activities. On the contrary, because relatively little is known about the physiological and behavioral impacts of overflights, bombing, missile delivery, and strafing on pronghorns, the Air Force should cease these activities pending formal consultation.

Conclusion:

Based on my professional expertise and review of the literature on this subject, I firmly believe the current activities of the Air Force, i.e., low-level overflights, bombing and strafing on NTAC and STAC, both harm and harass pronghorns. These activities result in significant, albeit sometimes highly localized, habitat modification or degradation and may actually kill or injure pronghorns by significantly impairing their essential behavior patterns, including breeding, feeding or sheltering. These activities also create the likelihood of injury to pronghorns by annoying the animals to such an extent that the activities significantly disrupt their normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering.

The fact that a large proportion of the live bombs dropped on NTAC and STAC are dropped in February and March, the two most critical months in terms of reproductive success of Sonoran pronghorns, only serves to strengthen this opinion. Given the critically imperiled status of this subspecies, any disruption to the birthing process or decrease in reproductive success is likely to have enormous implications for population survival and recovery.

Furthermore, the Air Force's current efforts to detect the presence of pronghorns before conducting a bombing run simply cannot ensure that pronghorns are not on or near NTAC or STAC when bombing is conducted.

Based on these potential impacts, it is disconcerting to me that the Air Force has requested concurrence from the FWS for its "not likely to adversely affect" determination. This finding is clearly erroneous, is not supported by the available evidence, and should be flatly rejected by the FWS. Rather, I strongly encourage the FWS to conclude the Air Force's activities are extremely detrimental to the long term survival of pronghorns, to do whatever it can to compel the Air Force to immediately cease all activities (i.e., bombing, strafing, missile delivery, low-level overflights) on NTAC and STAC that may threaten pronghorns, and to implement scientifically sound pronghorn management practices that will promote, not detract from, pronghorn recovery.

I am more than willing to lend my guidance and expertise to the FWS on this issue. Should you desire to consult with me on this issue, please contact me at 406-657-2014.

Sincerely,

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Assistant Professor of Biology

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Mr. Bruce Palmer, Section Coordinator for Birds and Mammals, U.S. Fish and Wildlife Service, Ecological Services
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References

Arizona Game and Fish Department. 1981. The Sonoran Pronghorn. Special Report Number 10. Arizona Game and Fish Department, Phoenix, AZ.

Carr, J.N. 1971. Endangered Species Investigation. Sonoran Pronghorn.

Carr, J.N. 1972. Endangered Species Investigation. Sonoran Pronghorn.

Dames and Moore Environmental Services Group. 1988. Biological Assessment for Sonoran Pronghorn (Antilocapra americana sonoriensis) on the Barry M. Goldwater Range in Relation to Weapons Tactics Instructor Training at Marine Corps Air Station Yuma. 29pp.

deVos, J.C. 1989. Evaluation of Sonoran Pronghorn Movements Around Military Activity Sites on Barry M. Goldwater USAF Range. Arizona Game and Fish Department, Phoenix, AZ.

deVos, J.C. 1990. Selected Aspects of Sonoran Pronghorn Research in Arizona and Mexico. Pages 46-52 in: Managing Wildlife in the Southwest Symposium, P.R. Krausman and N.S. Smith (eds.). Tucson, AZ.

Geraghty & Miller, Inc. and SWCA, Inc. 1996. Biological Assessment for Sonoran Pronghorn on the Barry M. Goldwater Range.

Hervert, J.J., R.S. Henry, M.T. Brown, D.W. Belitsky, and M.E. Kreighbaum. 1995. Sonoran Pronghorn Population Monitoring: Progress Report. Technical Report 98, Arizona Game and Fish Department, Phoenix, AZ.

Hughes, K.S. and N.S. Smith. 1990. Sonoran Pronghorn Use of Habitat in Southwest Arizona. Final Report Number 14-16-009-2564 RWO #6. Arizona Cooperative Fish and Wildlife Research Unit, Tucson, AZ.

Krausman, P.R., M.C. Wallace, M.E. Weisenberger, D.W. DeYoung, and O.E. Maughan. 1993a. Effects of Simulate Aircraft Noise on Heart Rate and Behavior of Desert Ungulates. University of Arizona, Tucson, AZ. 70pp.

Krausman, P.R. M.C. Wallace, M.J. Zine, L.R. Berner, C.L. Hayes, and D.W. DeYoung. 1993b. The Effects of Low-altitude Aircraft on Mountain Sheep Heart Rate and Behavior.

University of Arizona, Tucson, AZ. 134pp.

Manci, K.M., D.N. Gladwin, R. Villella, and M.G. Cavendish. 1988. Effects of Aircraft Noise and Sonic Booms on Domestic Animals and Wildlife: A Literature Synthesis. U.S. Air Force/U.S. Fish and Wildlife Service. National Ecology Research Center, Fort Collins, CO.

U.S. Air Force. 1991. Draft Environmental Assessment for Supersonic Flight Operations over R-2301E of the Barry M. Goldwater Air Force Range. Prepared for Tactical Air Command.

U.S. Fish and Wildlife Service. 1994. Sonoran Pronghorn Recovery Plan Revision. U.S. Fish and Wildlife Service, Albuquerque, NM.

Weisenberger, M.E., P.R. Krausman, M.C. Wallace, D.W. DeYoung, and O.E. Maughan. 1996. Effects of Simulated Jet Aircraft Noise on Heart Rate and Behavior of Desert Ungulates. Journal of Wildlife Management. 60(1):52-61.

Workman, G.W., T.D. Bunch, J.W. Call, F.C. Evans, L.S. Neilson, and E.M. Rawlings. 1992. Sonic Boom/Animal Disturbance Studies on Pronghorn Antelope, Rocky Mountain Elk and Bighorn Sheep. Utah State University Foundation, Logan, UT.

Wright, R.L. and J.C. deVos. 1986. Final report on Sonoran Pronghorn Status in Arizona. Contract Number F0260483MS143. Arizona Game and Fish Department, Phoenix, AZ.

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EDUCATION

Doctor of Philosophy, Animal Behavior (with emphasis in Ecology and Evolution), University of California, Davis, June, 1992. Dissertation: Variable behavior of pronghorn (*Antilocapra americana*): flexibility in male social organization and female group stability. Advisor: Dr. Dale F. Lott.

Master of Science, Animal Behavior, University of California, Davis, September, 1990. Awarded by examination. Advisor: Dr. Dale F. Lott.

Master of Science, Zoology, University of Idaho, Moscow, May, 1986. Thesis: Age-related changes in reproductive effort of male bison. Advisor: Dr. John A. Byers.

Bachelor of Science, Zoology, Miami University, Oxford, Ohio, May, 1984. Graduated summa cum laude, Phi Beta Kappa, with General Honors, and with Honors in Zoology.

TEACHING AND RESEARCH EXPERIENCE

PRESENT POSITIONS:

Assistant Professor of Biology, Montana State University - Billings, 8/92-present. Responsible for the ecology and zoology portions of a year-long, integrated, team-taught sophomore-level course in Organismal Biology. Taught upper division courses in Behavioral and Evolutionary Ecology, Vertebrate Zoology; Ecology, Ecology Lab for sophomores; the zoology portion of General Biology for freshmen biology majors; and the survey biology course for non-majors. Co-taught course in Environmental Ethics. Administered the qualifying examination for sophomore biology students. Supervised undergraduate students in research projects.

Curator of Behavior, ZooMontana, Billings, 4/96-present. Responsible for coordinating the program of environmental enrichment on animals housed at ZooMontana. Acted as academic liaison between the university and the zoo. Supervised undergraduate students engaged in research at the zoo.

Lecturer, Comparative Psychology, University of California, Davis, 4/92-6/92. Presented lectures illustrating concepts and examples in animal behavior to 125 students. Emphasized a functional and comparative approach to the study of animal behavior. Topics included neuroethology, behavioral genetics, learning, navigation, social organization, behavioral ecology. Also supervised one teaching assistant. Offered in Dept. of Psychology.

Graduate Study, University of California, Davis, 9/86-3/92. Conducted research on the mating system and social behavior of pronghorn antelope, emphasizing spacing system of males and mate choice strategy of females. Documented status following translocation of pronghorn to historic range. Reviewed ecological variables influencing vertebrate spacing systems. Dr. Dale Lott, Department of Wildlife and Fisheries Biology.

Teaching Assistant, Behavioral and Evolutionary Biology of the Human Life Cycle, University of California, Davis, 1/92-3/92. Responsible for three discussion sections each week, helping students understand the life cycle of humans from a behavioral and ecological basis. Graded essay exams and term papers. Offered in Dept. of Anthropology.

Teaching Assistant, Concepts of Wildlife Ecology, University of California, Davis, 9/91-12/91, 6/91-8/91, 9/90-12/90. Responsible for two-four discussion sections each week, treating lecture material in more depth and discussing current issues in wildlife conservation. Delivered lectures, including material on habitat, niche, community ecology, and ethics. Wrote discussion and examination questions; graded homework, exams, and term papers; and maintained records of student grades. Offered in Dept. of Wildlife and Fisheries Biology.

Post-Graduate Researcher, University of California, Davis, 6/91-9/91. Produced a statewide management plan for wild turkeys for California Department of Fish and Game. Responsibilities included literature review, gathering sources, synthesizing the information, and writing a plan to be used by state and federal agencies to decide future research projects for wild turkeys. Dr. Dale Lott, Department of Wildlife and Fisheries Biology, and Dan Connelly, California Department of Fish and Game.

Research Assistant, University of California, Davis, 5/91-6/91. Conducted literature reviews and organized data and other information on pronghorn ecology, behavior, and management. Prepared a leaflet for Cooperative Extension to be distributed to private landowners in California. Organized the text, accumulated figures and maps, and did the layout for the leaflet. Dr. Dale Lott, Department of Wildlife and Fisheries Biology.

Teaching Assistant, Introductory Biology, University of California, Davis, 1/91-3/91, 4/91-6/91.Taught one laboratory and one discussion section each week covering animal diversity, form and function, and evolutionary concepts. Demonstrated techniques; led discussions; graded assignments, lab notebooks, and lecture exams; recorded grades. Offered in Dept. of Zoology.

Research Assistant, University of California, Davis, 11/89-1/90; 9/88-3/89; 9/87-1/88. Conducted literature reviews on ecological correlates of social systems. Compiled bibliography, tables, and performed word processing. Dr. Dale Lott, Department of Wildlife and Fisheries Biology.

Graduate Student Assistant, California Department of Fish and Game, 3/89-12/89. Conducted field research and data analysis on pronghorn antelope reintroduced to San Luis Obispo County, California. Dr. Eric Loft, California Fish and Game, Sacramento.

Teaching Assistant, Ecology and Evolution of Vertebrate Social Organization, University of California, Davis, 1/88-3/88. Led discussions on theory and research in behavioral ecology of vertebrates. Co-wrote discussion and examination questions. Graded discussion homework and examinations. Maintained records. Offered in Dept. of Wildlife and Fisheries Biology.

Graduate Study, University of Idaho, Moscow, 8/84-5/86. Performed research project on male bison, observing their behavior during the summer and mating seasons to determine if their reproductive effort, namely in the form of male-male competition, depended on the age of the bull. Dr. John A. Byers, Department of Biological Sciences.

Instructional Assistant, General Zoology, University of Idaho, Moscow, 8/85-5/86. Taught bi-weekly laboratories in elementary physiology and taxonomy of animals. Demonstrated techniques. Wrote laboratory practical exams. Graded homework assignments, laboratory exams, and lecture exams. Organized the teaching material. Offered in Dept. of Biological Sciences.

Instructional Assistant, Introduction to Biological Sciences, University of Idaho, Moscow, 8/84-5/85. Taught weekly laboratories demonstrating basic principles of biology. Demonstrated techniques and guided experiments. Led weekly discussions on material covered in lecture. Graded weekly quizzes and lecture examinations. Offered in Dept. of Biological Sciences.

PUBLICATIONS

Maher, C.R. in press. Group stability, activity budgets, and movements of female pronghorn antelope. *Southwestern Naturalist.*

Maher, C.R. and Lott, D.F. 1995. Definitions of territoriality used in the study of variation in vertebrate spacing systems. *Animal Behaviour.* 49:1581-1597.

Maher, C.R. 1994. Pronghorn male spatial organization: population differences in degree of non-territoriality. *Canadian Journal of Zoology.* 72:455-464.

Maher, C.R. 1991. Activity budgets and mating system of male pronghorn at Sheldon National Wildlife Refuge, Nevada. *Journal of Mammalogy.* 72:739-744.

Maher, C.R. and Lott, D.F. 1991. Pronghorn in California: information for the private landowner. University of California Cooperative Extension publication.

Maher, C.R. and Byers, J.A. 1987. Age-related changes in reproductive effort of male bison. *Behavioural Ecology and Sociobiology,* 21:91-96.

Maher, C.R. and Lott, D.F. in review. Discovering the ecological determinants of territoriality in vertebrates: past, present and future. Submitted to *Behaviour.*

Maher, C.R. in prep. Ecological and physiological correlates of spacing systems in two pronghorn populations.

Maher, C.R. in prep. Temporal changes in pronghorn spatial organization.

Mitchell, C.D. and Maher, C.R. in prep. Horn and age relationships in pronghorns.

Maher, C.R. and Mitchell, C.D. in prep. Effects of selective hunting on the behavior patterns of pronghorn males during the rut.

PRESENTATIONS/ABSTRACTS/ POSTERS

Mitchell, C.D. and Maher, C.R. Pronghorn age and horn size. Presented at the 1996 Annual Meeting of The Wildlife Society, October, 1996.

Maher, C.R. Ecological correlates of spatial organization in pronghorn males. Presented at the 1996 Annual Meeting of the Montana Academy of Sciences, April, 1996.

Besel, R. Blatnick, J., Maher, C.R., and Kirkpatrick, J. Effects of visitors on behavior patterns of captive Siberian tigers: preliminary results. Presented at the 1996 Annual Meeting of the Montana Academy of Sciences, April, 1996.

Lofthouse, A., Maher, C.R., and Kirkpatrick, J. Effects of environmental enrichment on captive North American river otter behavior patterns: preliminary results. Presented at the 1996 Annual Meeting of the Montana Academy of Sciences, April, 1996.

Maher, C.R. Ecological correlates of variable spacing systems in pronghorn males. Invited presentation given at the Dept. of Biological Sciences, Central Washington University, April, 1996.

Maher, C.R. Correlates of variable spatial organization in two pronghorn populations. Presented at the 1996 Annual Meeting of the Montana chapter of The Wildlife Society, March, 1996.

Mitchell, C.D. and Maher, C.R. Relationship of age and horn size in pronghorn. Presented at the 1996 Annual Meeting of the Montana chapter of The Wildlife Society, March, 1996.

Berkeley, E.V., Maher, C.R., Rachlow, J. and Kirkpatrick, J.F. Fecal testosterone concentrations in territorial and nonterritorial pronghorns and southern white rhinoceroses. Poster presented at the 1996 Annual Meeting of the Montana chapter of The Wildlife Society, March, 1996.

Maher, C.R. Ecological and physiological correlates of spatial organization in pronghorn males. Invited presentation given at the Department of Biology, Colorado College, February, 1996.

Maher, C.R. Quantitative descriptions of spatial organization in two pronghorn populations. Presented at the 1995 Annual Meeting of the Animal Behavior Society, July, 1995.

Maher, C.R. Quantitative comparison of spatial organization in pronghorn males. Presented at the Black Hills Studies Conference, Black Hills State University, South Dakota, April, 1995.

Maher, C.R. A quantitative analysis of variable spatial organization in pronghorn males. Presented at the 1995 Annual Meeting of the Montana Academy of Sciences, April, 1995.

Maher, C.R. Group stability and movements of female pronghorn: implications for mate choice. Presented at the 1994 Annual Meeting of the Montana Academy of Sciences, April, 1994.

Maher, C.R. Quantitative description of behavior of male pronghorn and differences in degree of non-territoriality. Presented at the 1993 Annual Meeting of the Animal Behavior Society, July, 1993.

Maher, C.R. Quantitative analysis of non-territorial pronghorn males. Presented at the 1993 Annual Meeting of the Montana Academy of Sciences, April, 1993.

Maher, C.R. Are female pronghorn more mobile during the breeding season? Poster presented at the 1992 Annual Meeting of the American Society of Naturalists, June, 1992.

Maher, C.R. Are female pronghorn more mobile during the breeding season? Poster presented at Animal Behavior Research Training Grant Workshop, April, 1992.

Maher, C.R. Spatial organization of male pronghorn in a translocated population: defending food or females? Invited speaker at Texas A&I University, January, 1992.

Maher, C.R. Status of pronghorn translocated to San Luis Obispo County, California. Seminar presented in Wildlife and Fisheries Biology Seminar Series, University of California, Davis, December,1990.

Maher, C.R. Behavior and ecology of pronghorn translocated to the Carrizo Plain, San Luis Obispo County. Presented at the 1990 Annual Meeting of the Southern California Academy of Sciences.

Maher, C.R. Behavior of male pronghorn at Sheldon National Wildlife Refuge, Nevada. Poster presented at the 1989 Annual Meeting of the Animal Behavior Society. Received Honorable Mention in Founders Award competition.

Maher, C.R. Behavior and social organization of male pronghorn at the Sheldon National Wildlife Refuge, Nevada. Seminar presented in Wildlife and Fisheries Biology Seminar Series, University of California, Davis, May, 1989.

Maher, C.R. Reproductive effort in male bison. Presented at the 1986 meeting of the Pacific Northwest Bird and Mammal Society.

Maher, C.R. and Byers, J.A. Age-related changes in reproductive effort of male bison. Presented at the 1987 Annual Meeting of the Animal Behavior Society.

PROFESSIONAL ACTIVITIES

American Society of Mammalogists
Animal Behavior Society (serving on Research Grants Committee, 1995-98)
Council on Undergraduate Research (serving as Institutional Liaison)
Ecological Society of America
International Society for Behavioral Ecology
Montana Academy of Sciences (served as Vice President, Biological Sciences section, 1994-95, 1995-96)
Sigma Xi

CAMPUS SERVICE ACTIVITIES

Undergraduate Curriculum Committee (1996-99)
Environmental Studies Advisory Group (1996-present)
College of Arts and Sciences' Honors Program Task Force (1995-present)
Chancellor's Advisory Group (1994-95)
Space Utilization Committee (1994-present)
Student Computer Fees Committee (1992-94; chaired Computer Users Advisory Subcommittee)

GRANTS/AWARDS

"Effects of selective hunting on the behavior of a pronghorn population, Fort Belknap Reservation, Montana"

U.S. Fish and Wildlife Service -- 1996, $2000
Montana State University, Billings Research and Creative Endeavor Grant -- 1996, $500
Montana State University Faculty Development Award -- 1996, $206
U.S. Fish and Wildlife Service -- 1995, $1500

"Ecological and physiological correlates of variable spatial organization in pronghorn males"

Montana State University Faculty Development Award -- 1995, $1075
Black Hills Natural History Association Grant -- 1995, $300
Montana State University, Billings Research and Creative Endeavor Grant -- 1994, $1250
Montana State University, Billings Foundation Grant -- 1994, $1200
Black Hills Natural History Association Grant -- 1994, $300
Eastern Montana College Foundation Grant -- 1993, $1200
Easter n Montana College Research and Creative Endeavor Grant -- 1993, $760

"Spatial organization and female group stability in a translocated pronghorn population"

Theodore Roosevelt Memorial Fund -- 1990, $883
Renewable Resources Extension Act Grant -- 1990, $5000
Graduate Research Award -- 1990, $500
San Luis Obispo County Fish and Game Fines Commission -- 1990, $3000
Golden Gate chapter, Safari Club International -- 1990, $2000
Sacramento Safari Club grant -- 1989, $5000
San Luis Obispo County Fish and Game Fines Commission grant -- 1989, $2000
San Fernando Valley Wildlife Fund grant -- 1989, $2000
Sigma Xi grant -- 1988, $400
Outstanding Research Award, University of California -- 1987, $500

"Age-related changes in reproductive effort of male bison"

Sigma Xi grant -- 1985, $250

DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

0 3 SEP 1996

56 FW/RMO
14185 West Falcon Drive
Luke AFB, AZ 85309-1629

Mr. Sam Spiller
State Supervisor
U.S. Fish and Widlife Service
Arizona Ecological Services State Office
2321 W. Royal Palm Road, Suite 103
Phoenix, AZ 85021-4951

Dear Mr. Spiller:

Under Section 7(a)2 of the Endangered Species Act of 1973 as amended, and CFR Section 402.14, Luke Air Force Base (AFB), Barry M. Goldwater Range (BMGR), requests formal Section 7 consultation for the continued use of ground-surface and airspace for military training on the BMGR which may affect the endangered Sonoran pronghorn *Antilocapra americana sonoriensis*.

The proposed action is the continuation of military training activities involving the use of low flying military aircraft expending live and/or inert ordnance in controlled target areas including the features generally referred to as H.E. (High Explosive) Hill, South TAC and H.E. Hill, North TAC. Military training has been conducted within the BMGR for over fifty years. The involved areas are located on the BMGR within the BLM's Lower Gila Resource Management Area, Maricopa, Yuma, and Pima counties in Townships 8, 9,10, 11, S and Ranges 8, 9, 10 W. Refer to the attached vicinity maps and information provided within the attached Biological Assessment (BA). These training areas involve approximately 200,000 acres of Sonoran pronghorn habitat.

The affects of proposed ongoing military training on Sonoran pronghorn and their habitat have been, and will continue to be, analyzed. Additionally, Luke AFB has been an active member of the Sonoran Pronghorn Core Working Group; participated in pronghorn radio-telemetry and aerial surveys; conducted on-site monitoring in training areas; initiated a Memorandum of Understanding with the Cabeza Prieta National Wildlife Refuge; funded $371,000 of pronghorn research, and informally consulted with your office via letters, phone calls and a site visit to the BMGR on January 18, 1996. Luke AFB recently provided a site review of North and South TAC Ranges with Defenders of Wildlife Biologists on August 20, 1996. Many of these efforts relating to Sonoran pronghorn have been ongoing since 1982.

ATTACHMENT C

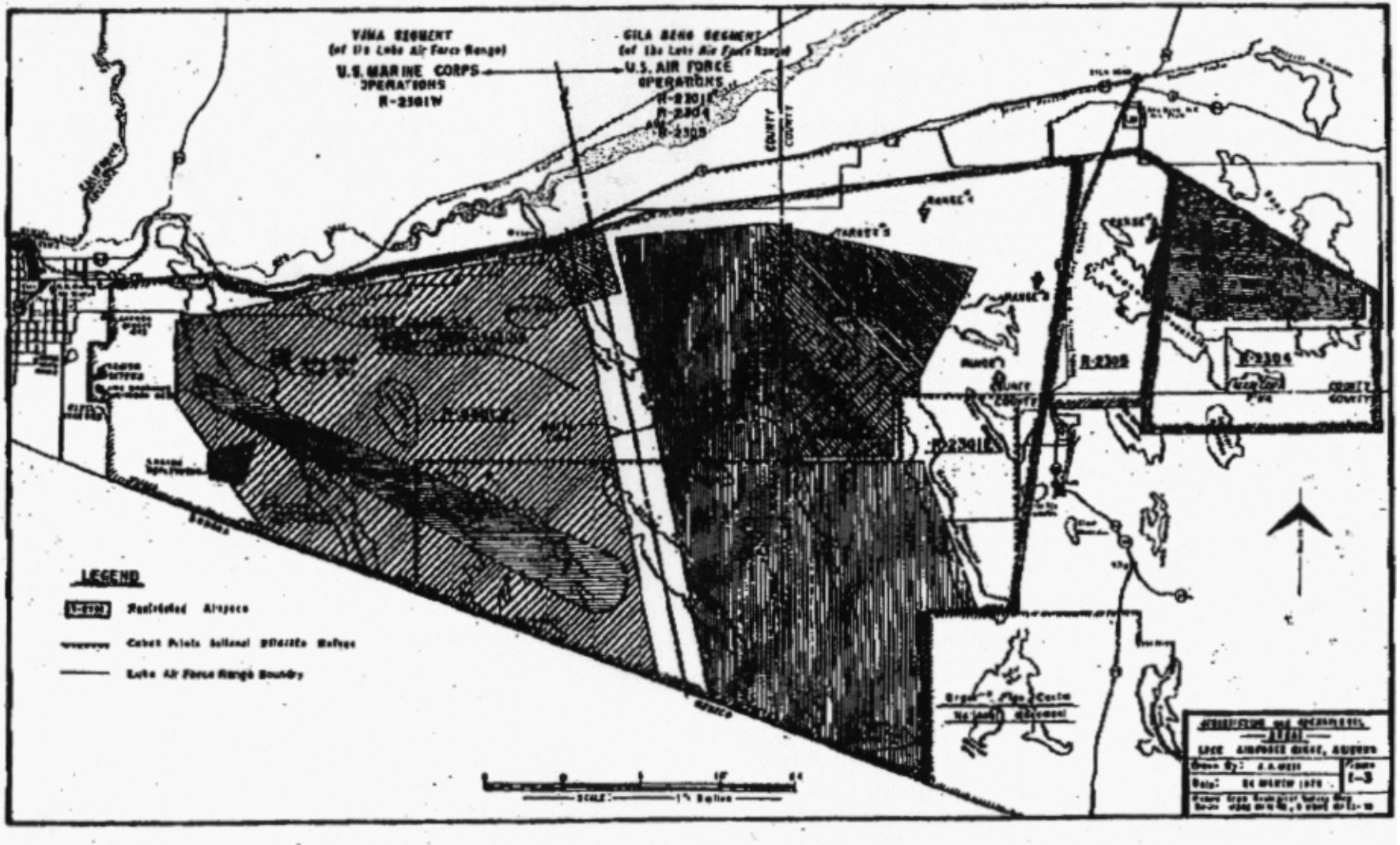
We have concluded that continued military training, as proposed, may affect, but is not likely to adversely affect, the Sonoran pronghorn. In addition to formal Section 7 consultation, we request your concurrence with our finding of not likely to adversely affect the Sonoran pronghorn.

Should you require further information or have any questions, please contact Mr. Bruce D. Eilerts of the Natural/Cultural Resources and Environmental Analysis Section at (602) 856-3823 or facsimile (602) 856-3817.

DAVID L. WHITE, Col, USAF
Director, Range Management Office

Attachments
Vicinity Maps
Biological Assessment

cc:
Defenders of Wildlife
BLM Phoenix District



AJO 1:250,000

John Rogers, Director
United States Fish and Wildlife Service
1849 C Street, N.W.
Washington, D.C. 20240

10 September 1996

Re: Biological Assessment for Sonoran Pronghorn on the Barry M. Goldwater Range

Dear Mr. Rogers,

I am writing to express Defenders of Wildlife's ("Defenders") concern with the "Biological Assessment for Sonoran Pronghorn on the Barry M. Goldwater Range" ("BA"), prepared for the U.S. Air Force (USAF) by Geraghty & Miller, Inc. and SWCA, Inc. Although we have not yet had an opportunity to review the BA and the literature cited in it in detail, our initial analysis reveals that this BA is deficient in several areas and fails to adequately describe and assess the effects that ongoing military activities on Goldwater Range may be having on the Sonoran pronghorn (*Antilocapra americana sonoriensis*). In short, we urge you to reject the Air Forces' conclusion that its military activities are "not likely to adversely affect" the pronghorn. In addition, we urge you to reject this BA, and to render a "jeopardy" opinion in your biological opinion of these continued activities.

For your information, on 22 May 1996, Defenders sent a 60-day notice letter to the USAF, explaining the ways in which its military activities are adversely affecting the pronghorn and notifying the USAF of our intentions to bring a lawsuit under the Endangered Species Act if it does not cease these activities. I have attached a copy of that letter for your convenience. In addition, on 26 August 1996, after a site visit to the Range by Dr. Christine Maher and me, and in the face of the USAF refusing to stop any of its activities, Defenders notified the USAF that if it did not cease these detrimental activities by 4 September 1996, Defenders would be forced to bring a lawsuit. A copy of that letter is also attached.

In general, Defenders believes that the BA was prepared in a hasteful manner, perhaps in an effort to stave off a lawsuit. Indeed, we note that the BA was transmitted to the Fish and Wildlife Service ("FWS") one day before the deadline that Defenders provided the USAF in its 26 August 1996 letter. We believe that the preparers have simply responded to complaints we and independent scientists have raised in

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the recent past with regard to USAF activities on the Goldwater Range, and that the BA contains no real treatment or description of the threats that ongoing military activities pose to the endangered Sonoran pronghorn.

More specifically, the BA states that "an estimated 125 to 256 Sonoran pronghorn occur in Arizona". However, at a recent Population Viability Analysis (PVA) Workshop, organized by Defenders, a group of Sonoran pronghorn biologists suggested that the best current estimate for the US population is approximately 120, with several biologists suggesting that there may be as few as 80-100 remaining in the US. It appears that either the preparers failed to talk with Sonoran pronghorn experts in order to get these most current estimates, or else were unwilling to admit that the population is believed to be this low.

Defenders also believes that the entire discussion about historic population numbers is scientifically unjustified at best. The BA states that "methodologies and amounts of data upon which population estimates have been made vary widely and are likely to be incomparable" and then goes on to devote an entire page to that type of analysis. However, at the recently completed PVA workshop, Sonoran pronghorn biologists (some of which have been studying Sonoran pronghorn for as many as 12-14 years) explained that, without a doubt, Sonoran pronghorn numbers were much higher in the late 1800's, when their range far exceeded what it is currently.

The BA also criticizes another document in which it is suggested, without any reference or documentation, that there were historically many more pronghorn in the area than there are currently. The BA suggests that this sort of blanket statement is bad science and policy. However, the BA commits the exact same error numerous times (e.g., "All the individuals in the existing U.S. Sonoran pronghorn population probably have been exposed to aircraft overflights all of their lives and are likely to have become habituated"), except that each time the BA suggests an unsupported claim, the conclusion of that claim is that the USAF activity is of no detrimental effect to Sonoran pronghorn.

I have only recently begun to review the literature cited in support of the BA's claim that the pronghorn is "habituated" to these military activities. My initial review reveals that these publications in no way substantiate this assertion. I intend to submit further information on this point, as well as additional relevant information, within the next couple of weeks. In any event, Defenders believes that this BA is a poorly developed document that in no way will allow the FWS to make an educated decision concerning whether military activities on the Goldwater Range are jeopardizing the continued existence of Sonoran pronghorn. Defenders respectfully requests the opportunity to provide further, more detailed, comments on this BA, prior to any final FWS decision concerning the USAF request for concurrence on their finding of "not likely to adversely affect" the Sonoran pronghorn. The FWS should also obtain the views of Dr. Maher, who is

a pronghorn expert and has become extremely knowledgeable about the situation on the Goldwater Range.

Sincerely,

Dennis A. Hosack, Ph.D.
Conservation Biologist

cc: Nancy Kaufman, USFWS Region 2, Regional Director
Bruce Palmer, USFWS Arizona Ecological Services, Section Coordinator for Birds and Mammals
Bill Austin, USFWS Arizona Ecological Services, Fish and Wildlife Biologist
Col. David L. White, USAF Luke Air Force Base, Director of Range Management Office

March 28, 1996

Mr. Ron Pearce
United States Marines Corps
Box 99100
Yuma, AZ 85369-9100

Re: Yuma Complex DEIS and Goldwater Range Biological Assessment

Dear Mr. Pearce:

On behalf of Defenders of Wildlife and its more than 135,000 members nationwide, including more than 3,000 members in Arizona, we are pleased to submit the following comments on the Draft Environmental Impact Statement (DEIS) for the Yuma Training Range Complex (Yuma). The Yuma DEIS analyzes the proposed actions involved in the improvement of training procedures, development of training facilities, and reconfiguration of airspace at Yuma. The DEIS suggests that the proposed actions are necessary to allow the Marine Corps and other U.S. tactical air force personnel to receive proper training. We have very serious concerns about the negative effects these proposed actions will have on the Yuma complex as well as the deleterious effects the proposed actions will have on wildlife, particularly the Sonoran pronghorn antelope (*Antilocapra americana sonoriensis*), residing within the Cabeza Prieta National Wildlife Refuge (CPNWR).

The Sonoran pronghorn antelope was listed as endangered in 1967. Sonoran pronghorn population densities were reportedly several thousand in the late 1800s, but current population estimates vary from 80-100 to 256-313 (U.S. Fish and Wildlife Service, 1994). It has been reported that Sonoran pronghorn are frequently sighted, throughout the majority of the year, in herds of 10-20 animals in the Mohawk Valley, San Cristobal Valley, and on Luke Air Force Base (Wright and deVos, 1986). Various reasons have been postulated for the decline in Sonoran pronghorn numbers, including illegal hunting, overgrazing by livestock, drying of the Gila and Sonoyta Rivers, and human encroachment resulting in the loss, conversion, degradation, and fragmentation of pronghorn habitat. It is probable that each of these has contributed to the decline of the pronghorn population, but habitat loss, conversion, degradation, and fragmentation may continue to have the most profound negative influence on the ability of this species to survive.

Our major concerns with the DEIS and the proposed actions of the Marine Corps are based on the negative impacts that we believe the military overflights will have on Sonoran pronghorn antelope, both within CPNWR and on Yuma proper. In particular, Alternatives Set 1 suggests: 1) replacing the 11 existing corridors for low-level overflight of CPNWR by

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helicopters with three new corridors (Preferred Alternative 1-2) and 2) allowing up to 60 days per year of low-level overflights of CPNWR by fixed-wing aircraft in delineated corridors (Preferred Alternative 1-4).

At first glance, the reduction in the number of low-level overflight corridors for helicopters appears to be a positive alternative but, upon closer inspection, the flaw in this alternative is evident. Two of the three proposed corridors (RW1 and RW2) include areas within the Growler Mountains that have not previously been included in any low-level overflight corridor. In addition, both RW2 and RW3 include areas that are prime pronghorn habitat during fawning season, and thus should be considered off-limits for inclusion in any low-level overflight corridor. The DEIS stresses that the total number of helicopter flights would not change, which means that the number per corridor must increase, since the number of flights stays the same, but the number of corridors is reduced by >70%. Also, the previous length of all 11 corridors was 168 miles, whereas the new total length of the three proposed corridors is 189 miles, meaning that the proposed actions will result in an additional 21 miles of habitat degradation.

All of these concerns relate to the fact that these low-level overflights occur during the Weapons Tactics Instructors (WTI) course which is held biannually, during spring and fall. The spring course typically occurs during March/April, in the heart of the Sonoran pronghorn fawning season. In addition, as many as 15% of the WTI course overflights could occur at night. If these overflights result in either the female or fawn being startled enough to get up and move away from a bedding area, the chances of separation are increased as are the chances for predation. Many predators spend a majority of the night hunting, and a female-fawn pair that becomes separated is much more likely to suffer predation than are pairs that remain hidden. For Sonoran pronghorn, or any endangered species found at such low densities, each and every offspring produced has the potential to be of utmost importance to the overall survival and recovery of the species. It has been reported that ungulates can be startled, resulting in injury, as a consequence of low-level helicopter overflights (U.S. Fish and Wildlife Service, 1993).

The exact impacts of low-level overflights remain a topic of debate, but we believe that the data currently available indicates that low-level overflights by military aircraft pose a serious negative threat to the continued existence of Sonoran pronghorn antelope. We further believe that additional research will show, conclusively, that low-level military overflights are in direct conflict with the recovery of this endangered antelope. We acknowledge that some biologists disagree with the notion that flight disturbances hinder species recovery. Weisenberger *et al.* (1996) suggest that low-level overflights result in little or no affects on desert ungulates, but this study has several major flaws that invalidate its conclusions. Among the most fatal flaws, this research involved the use of simulated flight, not real aircraft, involved small sample sizes of two species (six mule deer (*Odocoileus hemionus crooki*) and five mountain sheep (*Ovis canadensis mexicana*)), and only looked at heart rate and behavior. One of the most important effects of

overflights and its related stress is the effect such overflights have on reproductive output and mortality, a measure not considered in the Weisenberger *et al.* (1996) study. The National Environmental Policy Act requires agencies to provide the public with "high quality" information and "[a]ccurate scientific analysis" (40 C.F.R. § 1500.1(b)). We do not believe that previous decisions regarding the impacts of low-level overflights on wildlife resources have met either of these requirements.

Indeed, several pronghorn experts have suggested that helicopter overflights probably have a greater impact than do fixed-wing aircraft (D. Kitchen pers. comm.). There is no doubt that low-level overflights that cause any stress in the pronghorn have a high likelihood of increasing fawn mortality, which in turn reduces the recruitment rate of the population, a key factor in determining the survivability of the species. Low-level overflights by helicopters at night, during the fawning season, are probably the most destructive aircraft activities that the military could schedule in this region. The idea of proposing corridors which will traverse previously unused airspace is disturbing, especially given the areas that the three proposed corridors overlay. This is some of the best Sonoran pronghorn habitat and fawning grounds, yet the Marine Corps wants to be able to conduct low-level overflights here. To do so would only serve to reduce the available undisturbed habitat for the Sonoran pronghorn to an even lower level than at present, serving to further restrict the available home range, and ultimately the ability of the population to increase. Additionally, as Table 3-12 (pg. 3-60), 3-16 (pg. 3-65), and 3-18 (pg. 3-66) of the DEIS indicate, en-route aircraft have the potential to have serious effects on local populations of wildlife. Table 3-12 lists March as the peak month of en-route operations, within airspace R-2301W (i.e., includes part of CPNWR), also a peak month for Sonoran pronghorn fawning activities. Table 3-16 indicates that CPNWR will receive the lowest overflights (i.e., 200 feet above ground level) as well as the highest sound exposure level (SEL), at 138 SEL dBA. Finally, Table 3-18 indicates that even this DEIS acknowledges that there is "...concern for wildlife management". As a result of the combination of these concerns, we do not agree with the reduction of corridors from 11 to three. Further, we do not believe that any low-level overflight corridors should exist in the airspace over CPNWR.

Proposed and preferred Alternative 1-4 seeks to increase the number of days that corridors, for low-level overflights by fixed-wing aircraft, can be activated. The proposed action suggests an increase in the total number of days available for activation from 12 to 60. This proposal has the potential to increase the total hours of overflight time from 14 hours up to 70 hours. The DEIS states that "more frequent activation of the corridors over the Refuge is desirable to optimize the training benefits", with absolutely no regard for the Refuge detriments that such military "benefits" will incur. It is our opinion that the current rate of usage of the airspace above the CPNWR is excessive and one of the main factors that has resulted in the continued need to maintain the Sonoran pronghorn antelope on the endangered species list. We believe that removal of this stress is likely to result in substantial improvement to the habitat, which will ultimately result in increases in Sonoran pronghorn antelope, a prerequisite for recovery

of the species. Further, it is our opinion that the current level of overflying is excessive and we are therefore strongly opposed to an increase in the number of available days of authorized usage by the military.

In regard to the proposed actions relating to ground support and associated activities, we again have several concerns, dealing mainly with the effects of these activities on Sonoran pronghorn antelope. A comparison of DEIS Figures 2-9 and 3-18 appears to indicate that there is a fairly distinct line where pronghorn range stops, which corresponds, not coincidentally, to the line where ground support structures and activities typically occur on Yuma. It is our opinion that the northwesternmost range of Sonoran pronghorn is being artificially reduced by the existing developments on Yuma, and that further developments will only serve to continue to restrict this species and the ecosystem of which it is a part. Further, the DEIS states (pg. 2-34) that the "...principal impacts to the areas are use by heavy vehicles ... and foot traffic from tens to even hundreds of troops". This type of disturbance would certainly lead to avoidance of the area by pronghorn (as well as most other species). These disturbances generally are associated with the WTI courses, typically take place for 30 or more days, and again are being conducted at a very stressful and nutritionally demanding time for Sonoran pronghorn. The period of lactation is generally agreed to be the period of most intense nutritional stress for most mammals. If these areas did not have the existing development, let alone the proposed new developments, they might be prime areas for pregnant and lactating females to meet these nutritional demands. In addition, these developments may serve as another reason why Sonoran pronghorn have not extended their range north of Highway 8. Certainly Highway 8 is an impediment to this process, but it may not even be possible for pronghorn to reach most areas bounded by Highway 8 due to military developments. The U.S. Fish and Wildlife Service Sonoran Pronghorn Revised Recovery Plan (1994) suggests that establishment of additional herds of pronghorn is vital to the recovery process and the areas north of Highway 8 are considered to have merit as potential Sonoran pronghorn habitat.

Additionally, the HAWK FIREX live-fire exercise is in direct conflict with efforts to provide wildlife with the most stress-free habitat possible. HAWK FIREX exercises involve the ground-launching of target drones, which military personnel attempt to shoot down with live HAWK missiles. The DEIS suggests that the direction of fire is to the southeast from the Baker Peaks with the impact usually occurring over the Mohawk Valley. The Mohawk Valley is one of the areas that the Revised Recovery Plan cites as an area in which pronghorns are frequently observed (U.S. Fish and Wildlife Service, 1994).

The DEIS is also insufficient in terms of inclusion and description of other wildlife species, ranging from endangered species to species of concern, that may be impacted by the activities already taking place at Yuma, as well as the proposed "improvements" to the facility. A short list of such species includes the loggerhead shrike (*Lanius ludovicianus*), Yuma puma (*Felis concolor brownii*), desert tortoise (*Gopherus agassizii*),

peregrine falcon (*Falco peregrinus anatum*), and chuckwalla (*Sauromalus obesus*). All of these species have either been observed in the general area that the proposed action intends to disturb, or else have the potential to be there, and might occur there if not for the proposed and past disturbances.

The DEIS is supposed to address direct, indirect, and cumulative impacts (Council on Environmental Quality Regulations, 40 C.F.R. § 1508.25(c)) that the proposed action may have on the chosen area. We believe that the Yuma DEIS insufficiently covers all three of these requirements. First, the proposed action is certain to hinder the recovery of Sonoran pronghorn antelope, yet no mention of this negative impact can be found within the DEIS. The proposed activities of low-level flying and ground disturbance within prime pronghorn habitat will likely have a direct negative impact on the reproductive output of this population. The Sonoran Pronghorn Recovery Plan Revision (1994) states that "The Sonoran pronghorn will be considered for reclassification from endangered to threatened 1. when an estimated population of 500 animals has been reached and remains stable over a five year period...". To achieve this density of animals will take considerable time, even if there are no disturbances to the pronghorn. We believe that if the proposed actions were allowed, the realistic chances of reaching this goal would be seriously compromised. Second, the proposed actions would appear to be likely to increase the growth of the Yuma area, resulting in potentially severe indirect effects to the areas wildlife. These impacts are likely to result from increased infrastructure requirements (e.g., power lines, phones lines, schools, and businesses), habitat degradation that accompanies increased population (e.g., clearing land for houses), and other human-induced habitat degradations (e.g., negative impacts from pets allowed to run free). All of these impacts tend to negatively affect wildlife and wildlife habitat, and therefore result in reduced wildlife populations in many residential areas. Third, the entire Yuma operation needs to be addressed, in terms of cumulative impacts of all the development that has already occurred, and is likely to occur in the future. We believe that the prior development and use of this area has resulted in the destruction of habitat that is critical to the recovery of the Sonoran pronghorn, as well as critical to the maintenance of the Sonora desert ecosystem. Further, we are of the opinion that this proposed action will negatively affect wildlife and wildlife habitat, but that, in isolation, it is just another step in the steady process that is likely to result in the total annihilation of the Southwestern desert ecosystem.

The Yuma DEIS states that the "no action" alternative is "...continued use of flight corridors, holding areas, and WTI schedule". We believe that the no action alternative should be a complete cessation of military activities within the Sonoran Desert, and that this alternative must be addressed if this document is to be considered complete. In this way, the proposed alternatives can be compared, both in terms of their effects on wildlife and on military operations, with the alternative of removing military presence from this fragile ecosystem. We believe, from a biological perspective, that this no action alternative would be the first step in restoring the Sonoron desert to its native state, with its full complement of both plant and wildlife species. Restoration of this ecosystem to a

dynamic community, with interacting biota should be considered an equal alternative to destruction of a unique ecosystem through the actions of military personnel. We also believe that the DEIS should include the cessation of use of the CPNWR airspace for training activities as another alternative. Although this alternative would result in decreased animal stress and habitat degradation, it would probably not result in the complete recovery of the Sonoran pronghorn. It would, however, be a step, on the path to ecosystem restoration.

We have also reviewed the Biological Assessment for the Marine Corps Use of the Barry M. Goldwater Range, Arizona (BA) (Dames and Moore, 1995). This document states that "Overflight noise from military aircraft can elicit behavioral and physiological responses from Sonoran pronghorn...", but that "...such responses are short term and unlikely to have serious or lasting detrimental effects." We are unaware of any scientifically sound research that has shown, without question, that low-level overflights by military aircraft have no lasting, detrimental effects on Sonoran pronghorn antelope. Therefore, we believe that this statement is incorrect, and, as stated above, we believe that further research will show that low-level overflights can have detrimental effects on Sonoran pronghorn, including an increase in the fawn mortality rate. Again, we believe that this effect can and does have serious implications for the survivability of this population of Sonoran pronghorn, and must be removed if we are to ever recover this species. The BA uses these two statements, with no reference to the literature, to discount any mitigation that would be necessary to offset the negative influences of such overflights. The BA goes further by claiming that the presence of the Marine Corps has served to "...afford significant protection of pronghorn habitat...". We agree that the Marine Corps activity occurs in a significant portion of what is available Sonoran pronghorn habitat, but disagree with the notion that the Marine Corps has "...imposed a very low-level of disturbance...". The fact that the proposed action area does encompass a significant portion of Sonoran pronghorn habitat increases the need to protect that habitat. The fact that the Marine Corps utilizes this area for any low-level overflights or ground activities, in and of itself results in unnecessary and extreme disturbance of the last habitat available for this species.

In summary, we believe that this DEIS and BA are lacking in consideration of the effects that the proposed actions will have on the Sonoran Desert ecosystem. In particular, the DEIS is insufficient in considering the serious, negative effects these activities have already, and will continue to have, on the federally endangered Sonoran pronghorn antelope. We believe that the negative effects of low-level overflights by military aircraft have not been shown to be negligible, and in fact will be shown to be detrimental to the continued existence of this species. Also, we believe that many of the proposed actions described in this DEIS will result in negative effects on the recovery efforts of the Sonoran pronghorn. Finally, we suggest that the DEIS must consider the removal of all military activities in this area, in order to aid in the recovery of the Sonoran pronghorn, and the eventual rehabilitation of the Sonoran Desert ecosystem.

We appreciate the opportunity to comment on this DEIS. If you have any questions or comments regarding the above points, please do not hesitate to contact us.

References

Dames and Moore. 1995. Biological assessment for the Marine Corps use of the Barry M. Goldwater Range, Arizona. Dames and Moore, Tucson, AZ. 47 pp.

U.S. Fish and Wildlife Service. 1993. Aircraft overflight issues on National Wildlife Refuges. U.S. Department of the Interior, Division of Refuges.

U.S. Fish and Wildlife Service. 1994. Sonoran Pronghorn Revised Recovery Plan. U.S. Fish & Wildlife Service, Albuquerque, NM. 40 pp.

Weisenberger, M. E., P. R. Krausman, M. C. Wallace, D. W. DeYoung, and O. E. Maughan. 1996. Effects of simulated jet aircraft noise on heart rate and behavior of desert ungulates. J. Wildl. Mgmt., 60:52-61.

Wright, R. L. and J. C. deVos Jr. 1986. Final Report on Sonoran Pronghorn Status in Arizona. Arizona Game and Fish Department. Phoenix, AZ. 132 pp.

Sincerely,

Dennis A. Hosack, Ph.D.
Conservation Biologist

Greg Sater (RMH)
Greg Sater
Wildlife Counsel

William J. Snape, III
Legal Director